Dietoterapia: Obesidade

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Excesso de peso: 2,1 bilhões de indivíduos

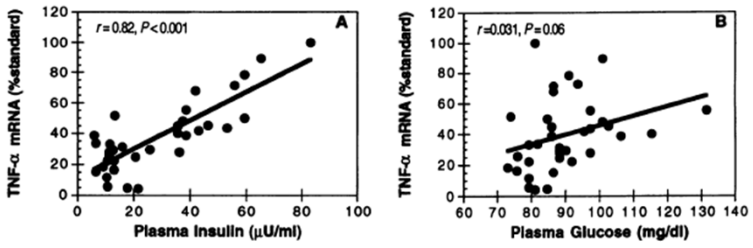
Obesidade: 640 milhões de indivíduos

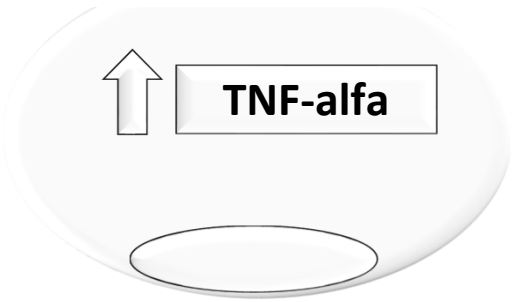
Prim Care Clin Office Pract 43:121–135, 2016

2

3

Adipócito



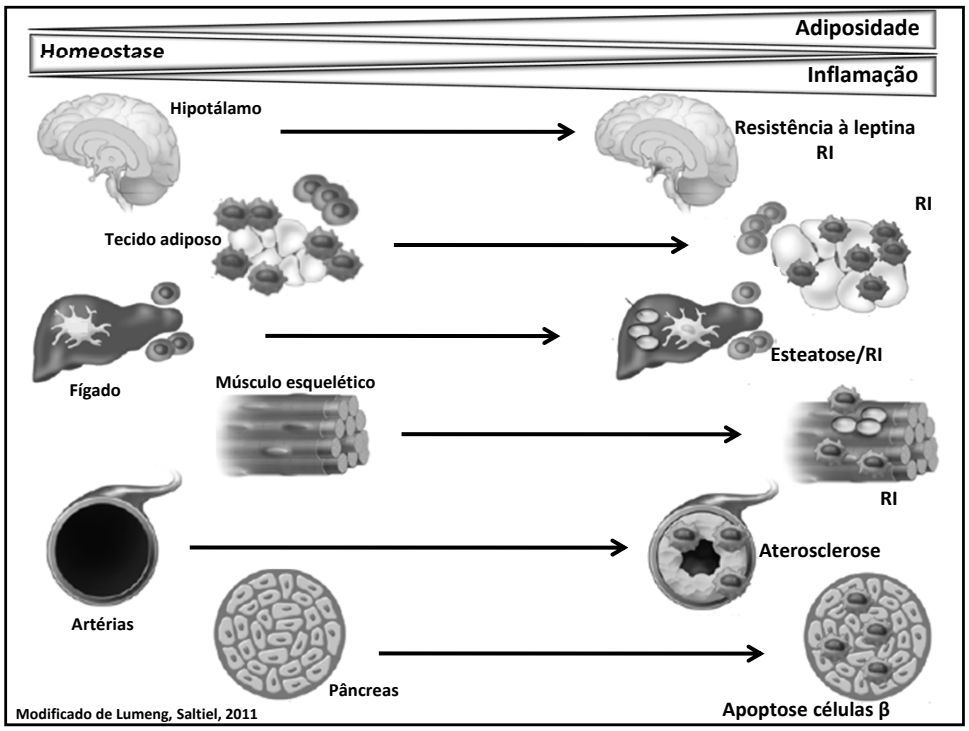


J. Clin. Investig. 95:2409–15, 1995

4

INFLAMAÇÃO METABÓLICA

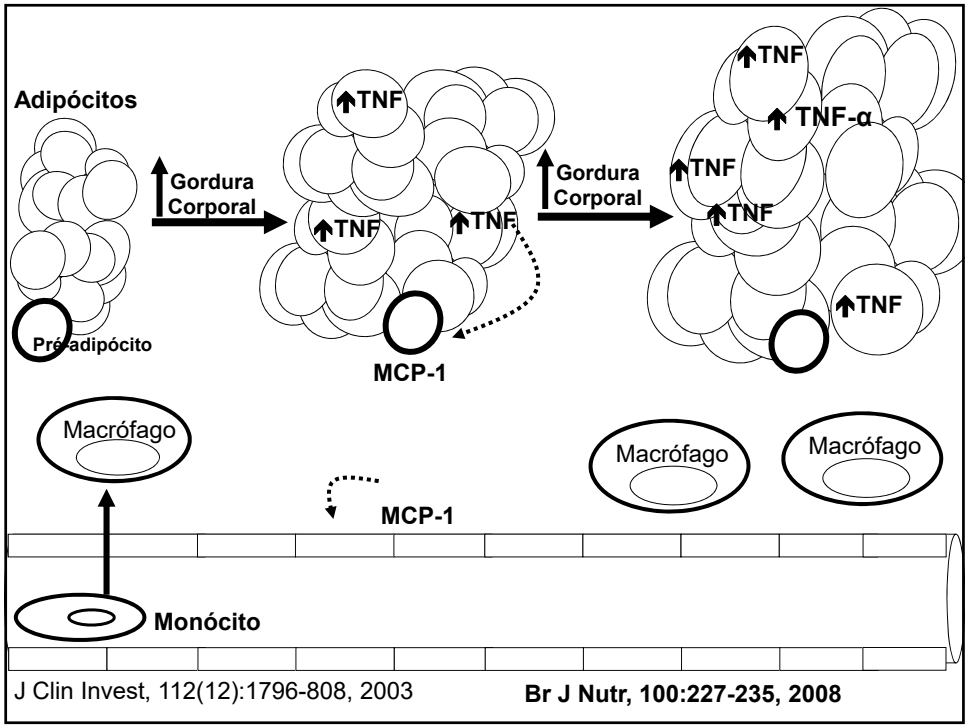
5



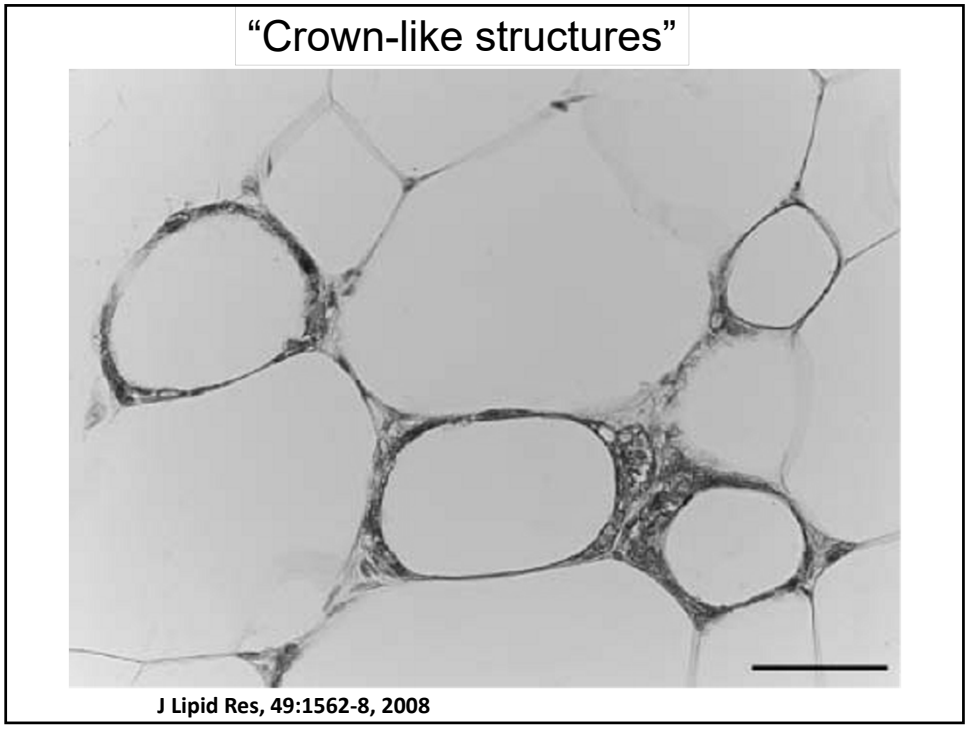
6


Inflamação e
Tecido Adiposo
Branco

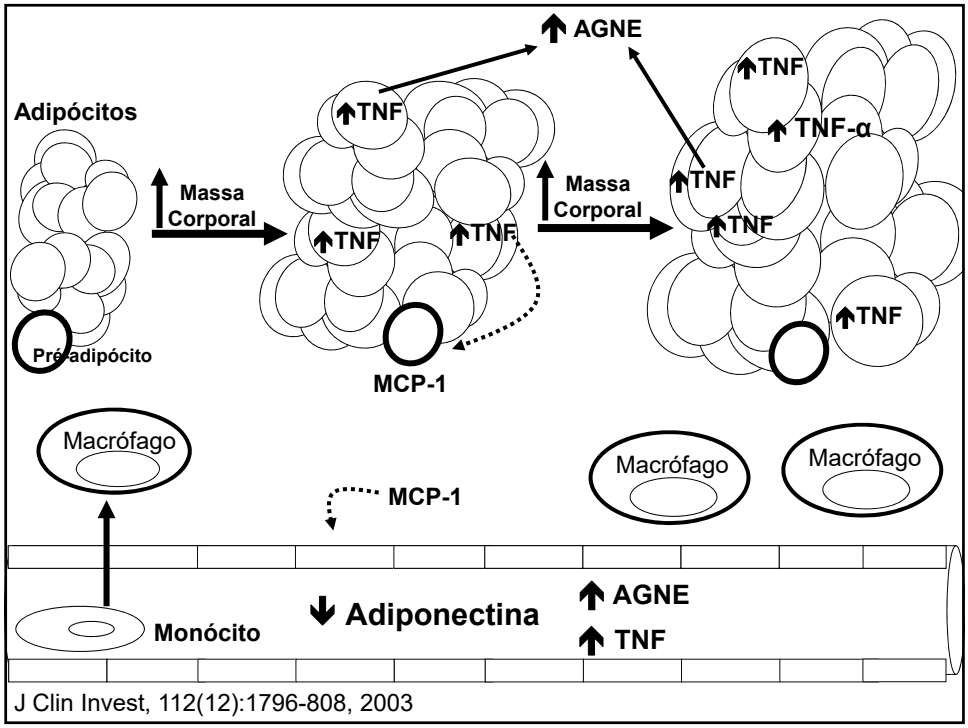
7


Adipócitos
Gordura Corporal
TNF
TNF
Pré-adipócito
MCP-1
Gordura Corporal
TNF
TNF-α
TNF
TNF
TNF
Macrófago
MCP-1
Macrófago
Macrófago
Monócito
J Clin Invest, 112(12):1796-808, 2003
Br J Nutr, 100:227-235, 2008

8


"Crown-like structures"
J Lipid Res, 49:1562-8, 2008

9


AGNE
Adipócitos
TNF
TNF-α
Massa Corporal
Massa Corporal
TNF
TNF
TNF
TNF
TNF
Pré-adipócito
MCP-1
Macrófago
Macrófago
Macrófago
MCP-1
Monócito
Adiponectina
AGNE
TNF
J Clin Invest, 112(12):1796-808, 2003

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Síndrome Metabólica

- Obesidade abdominal
- Dislipidemia aterogênica
- Resistência à insulina
- Estado pró-trombótico
- PA elevada
- Estado Inflamatório

Eur J Clin Nutr 63:S5, 2009; Circulation 112:2735, 2005

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Síndrome metabólica

Obesidade visceral (circunferência abdominal):

Sul-americanos e América Central: ≥90 cm (H); ≥80 cm (M)

TAG ≥150mg/dL ou tratamento

HDL <40mg/dl (H); <50mg/dL (M)

PAS ≥130 ou PAD ≥85mmHg ou tratamento

Glicemia de jejum ≥100 mg/dL ou diagnóstico prévio de diabetes

International Diabetes Federation, 2016

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Relação Cintura-Estatura

$$\frac{\text{Cintura}}{\text{Estatura}} < 0{,}5$$

ABESO, 2016

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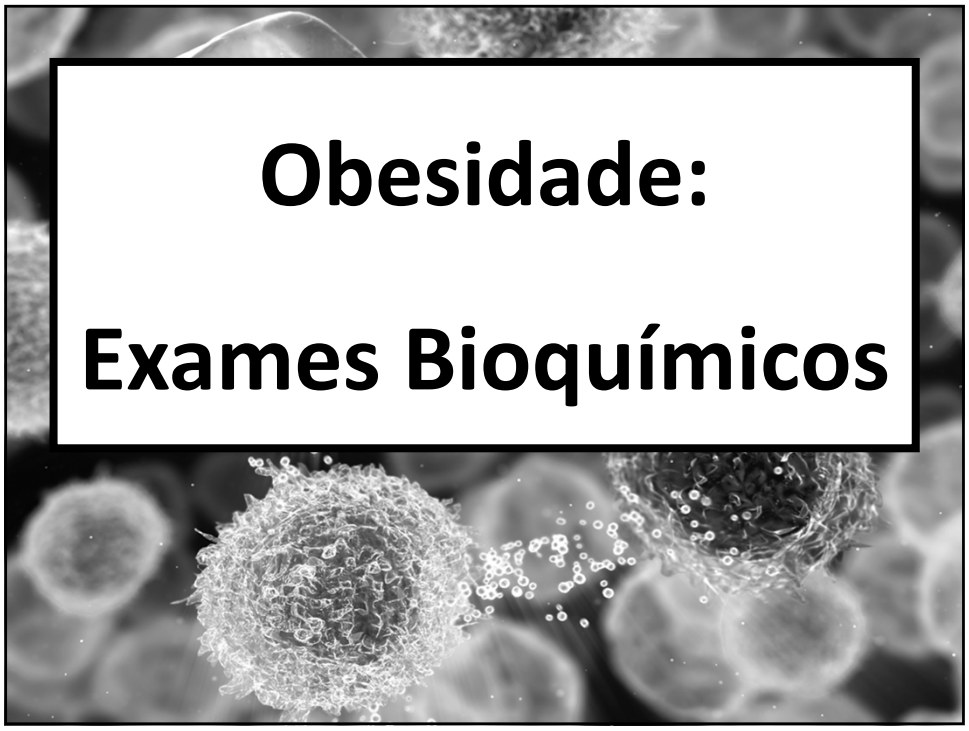

14

Exames bioquímicos

- ✓ Hemograma
- ✓ Perfil lipídico
- ✓ Glicemia de jejum
- ✓ Homocisteína
- ✓25-OH-colecalciferol
- ✓ Insulinemia de jejum
- ✓ Atividade sérica das enzimas ALT e AST
- ✓ Ácido úrico
- ✓Zinco, Cobre, Manganês
- ✓Tiamina sérica

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Índice HOMA (Homeostasis model assessment)

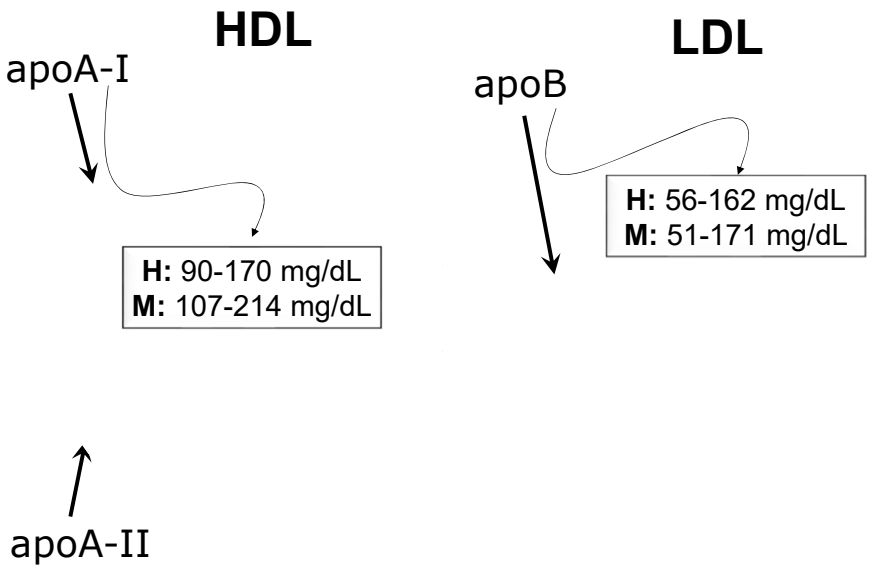
$$\text{HOMA-R} = \frac{\text{Insulinemia de jejum (µU/mL) x Glicemia de jejum (mg/dL)}}{405}$$

Ponto de corte (adultos) = 2,5

J Bras Patol Med Lab, 41:237, 2005

16

Razão apo A-I : apoB-100



Biochemistry 2000;39:9763-970 Atherosclerosis 1999;145:227-238

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Proteína C Reativa de Alta Sensibilidade

American Heart Association (AHA):

< 0,1 mg/dL: baixo risco

0,1 – 0,3 mg/dL: baixo intermediário

> 0,3 mg/dL: alto risco

OBS: > 1 mg/dL (verificar infecção / inflamação)

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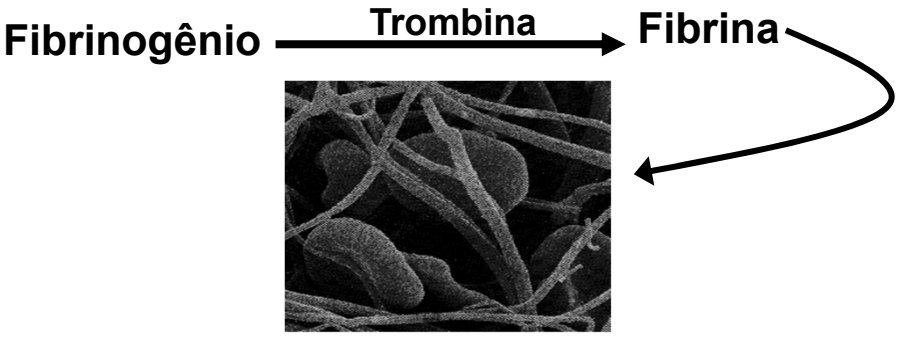
Fibrinogênio



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Dietoterapia

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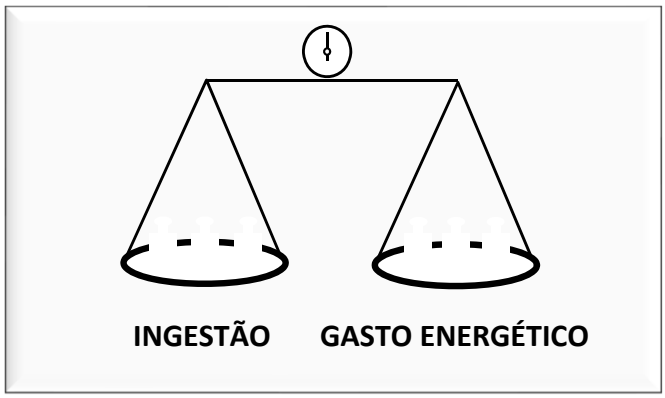
História Clínica

- Peso elevado desde a infância
- Família obesa
- Fator emocional desencadeante
- Sintomas de depressão
- Ansiedade
- Isolamento social

21



PERDA DE PESO:

INGESTÃO	↓	GASTO ENERGÉTICO	→
INGESTÃO	→	GASTO ENERGÉTICO	↑
INGESTÃO	↓	GASTO ENERGÉTICO	↑

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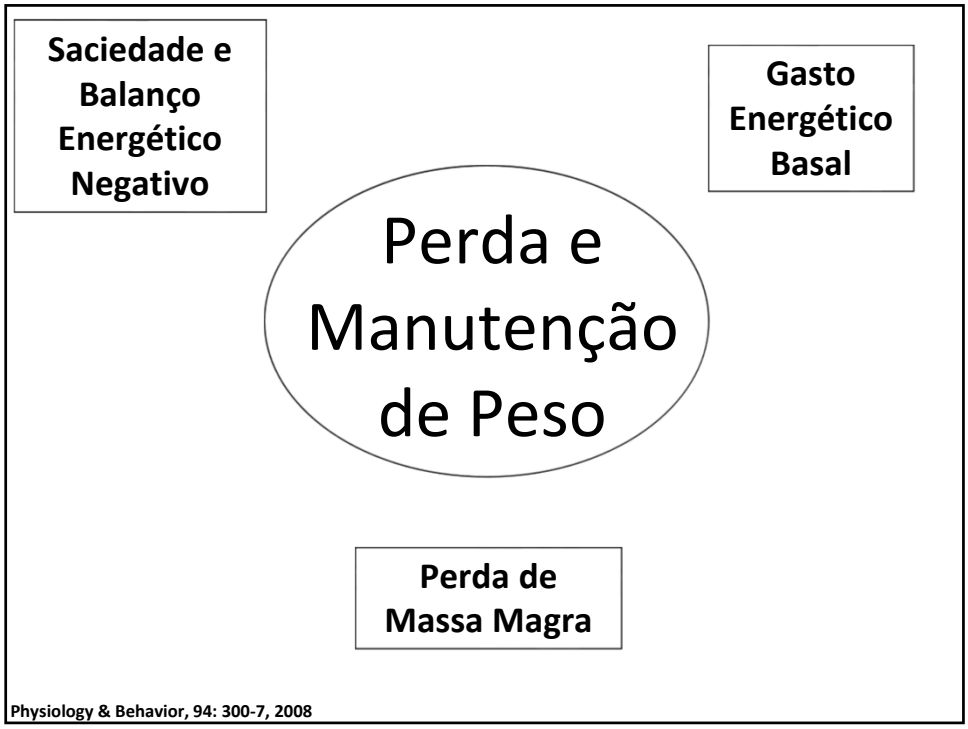

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Características da dieta

VET

24

Características da dieta

VET

Redução de 500 a 750 kcal por dia em relação ao GET

ou déficit de 30% em relação ao GET

Em uma semana: déficit de 500 kcal/dia

↓ 3.500 kcal ⟶ ↓ 450 g gordura corporal

Arquivos Brasileiros de Cardiologia - Volume 84, Suplemento I, Abril 2005

25

Obesity 3

Lancet, 2011, 378(9793):826-37

Quantification of the effect of energy imbalance on bodyweight

Kevin D Hall, Gary Sacks, Dhruva Chandramohan, Carson C Chow, Y Claire Wang, Steven L Gortmaker, Boyd A Swinburn

HOMENS

Déficit Calórico para atingir a perda de peso de 5% em 6 meses (kcal/dia)

25 kg/m²	**– 230 kcal/dia**
30 kg/m²	**– 290 kcal/dia**
35 kg/m²	**– 350 kcal/dia**
40 kg/m²	**– 410 kcal/dia**

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Obesity 3

Lancet, 2011, 378(9793):826-37

Quantification of the effect of energy imbalance on bodyweight

Kevin D Hall, Gary Sacks, Dhruva Chandramohan, Carson C Chow, Y Claire Wang, Steven L Gortmaker, Boyd A Swinburn

Mulheres

Déficit Calórico para atingir a perda de peso de 5% em 6 meses (kcal/dia)

25 kg/m²	– 200 kcal/dia
30 kg/m²	– 250 kcal/dia
35 kg/m²	– 300 kcal/dia
40 kg/m²	– 350 kcal/dia

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Momento da Ingestão

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Physiology & Behavior 134 (2014) 44–50

Contents lists available at ScienceDirect

Physiology & Behavior

journal homepage: www.elsevier.com/locate/phb

Timing of food intake and obesity: A novel association ☆

Marta Garaulet *, Purificación Gómez-Abellán

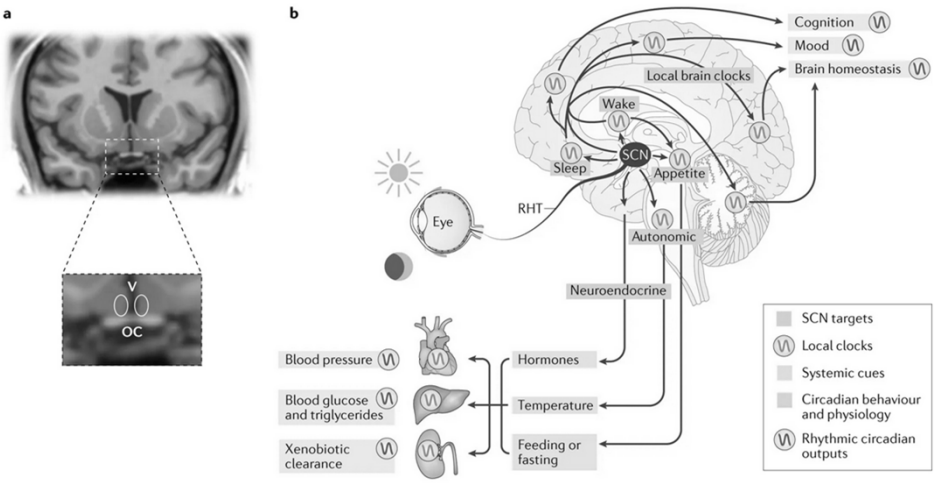
Department of Physiology, Faculty of Biology, University of Murcia, Spain

29

Generation of circadian rhythms in the suprachiasmatic nucleus

Michael H. Hastings, Elizabeth S. Maywood and Marco Brancaccio*

NATURE REVIEWS | NEUROSCIENCE



30

Original Article
CLINICAL TRIALS: BEHAVIOR, PHARMACOTHERAPY, DEVICES, SURGERY

Obesity

High Caloric Intake at Breakfast vs. Dinner Differentially Influences Weight Loss of Overweight and Obese Women

Daniela Jakubowicz,[1] Maayan Barnea,[2] Julio Wainstein[1] and Oren Froy[2]

700 kcal breakfast	200 kcal breakfast
500 kcal lunch	500 kcal lunch
200 kcal dinner	700 kcal dinner

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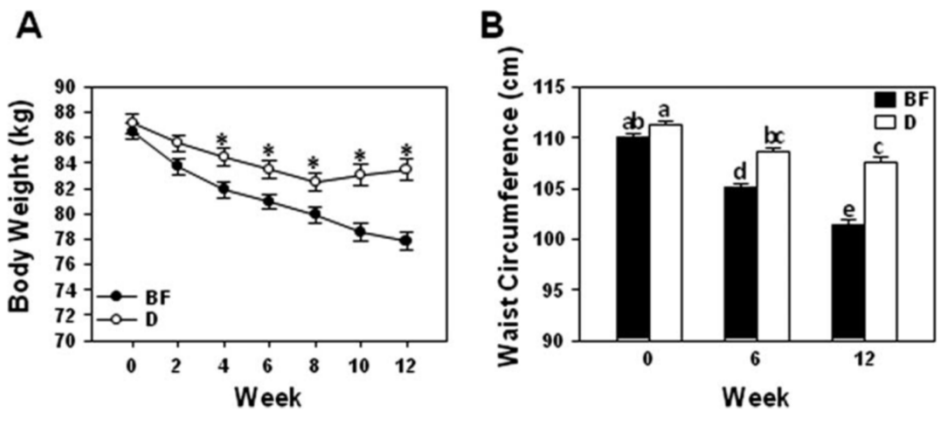
Original Article
CLINICAL TRIALS: BEHAVIOR, PHARMACOTHERAPY, DEVICES, SURGERY

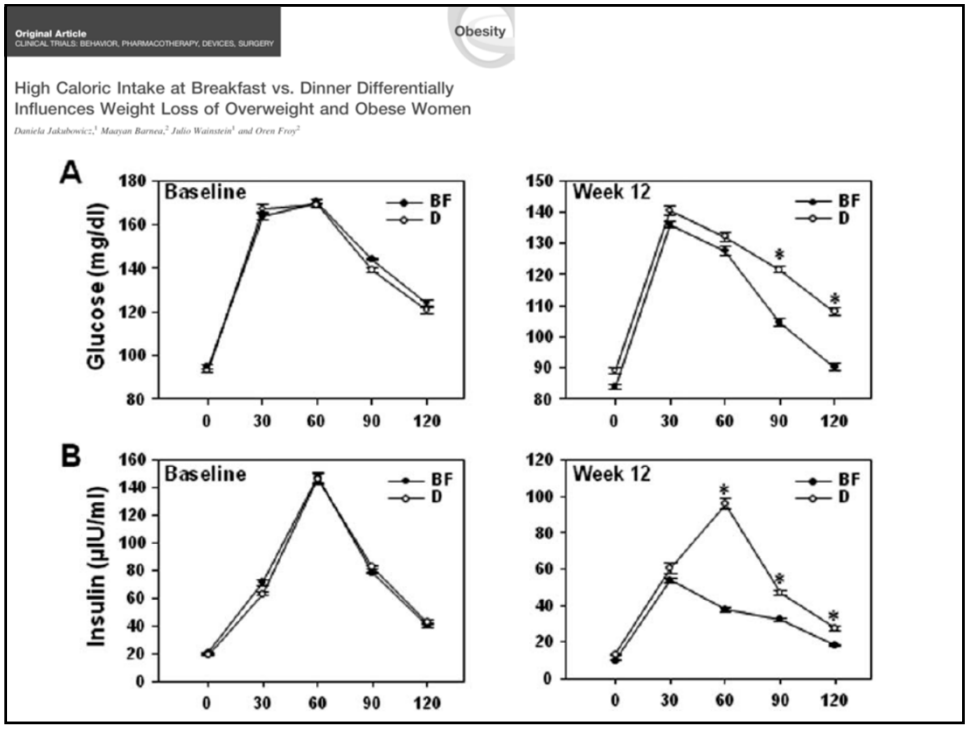
Obesity

High Caloric Intake at Breakfast vs. Dinner Differentially Influences Weight Loss of Overweight and Obese Women

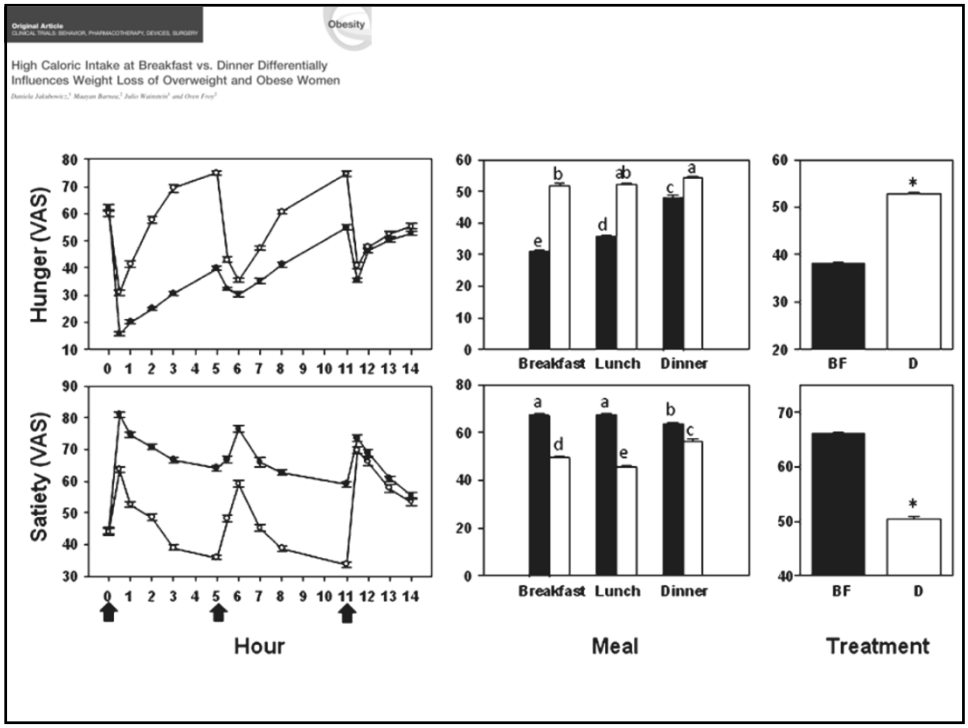
Daniela Jakubowicz,[1] Maayan Barnea,[2] Julio Wainstein[1] and Oren Froy[2]



32


Original Article
CLINICAL TRIALS: BEHAVIOR, PHARMACOTHERAPY, DEVICES, SURGERY
Obesity
High Caloric Intake at Breakfast vs. Dinner Differentially Influences Weight Loss of Overweight and Obese Women
A
Baseline
Week 12
BF
D
Glucose (mg/dl)
B
Insulin (µIU/ml)
0 30 60 90 120

33


Original Article
Obesity
High Caloric Intake at Breakfast vs. Dinner Differentially Influences Weight Loss of Overweight and Obese Women
Hunger (VAS)
Satiety (VAS)
Hour
Breakfast Lunch Dinner
Meal
BF D
Treatment

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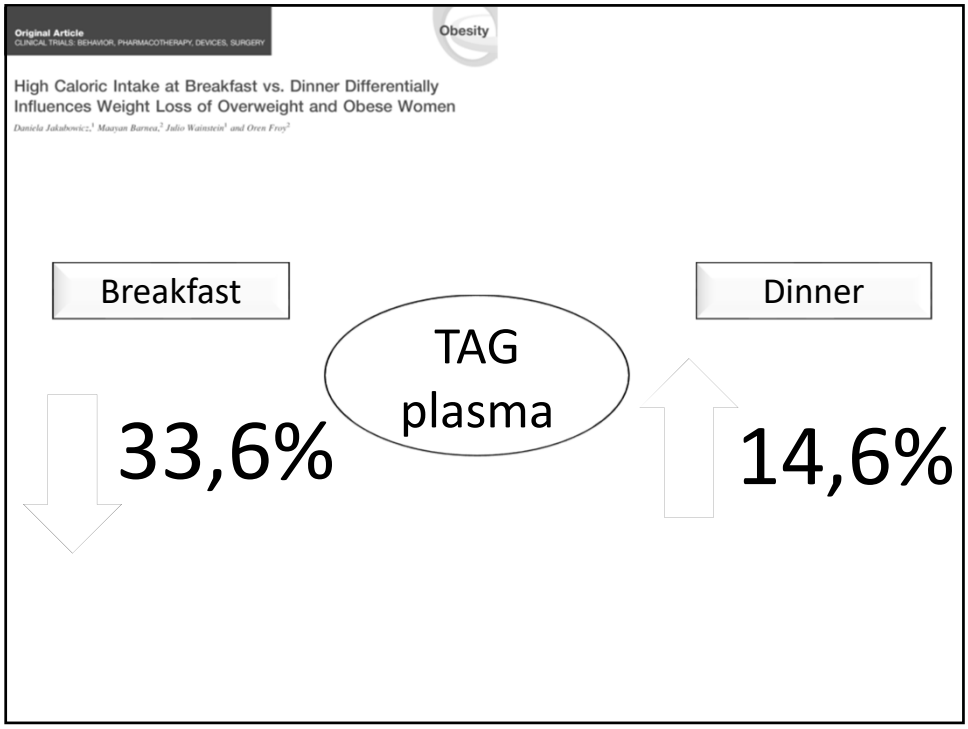
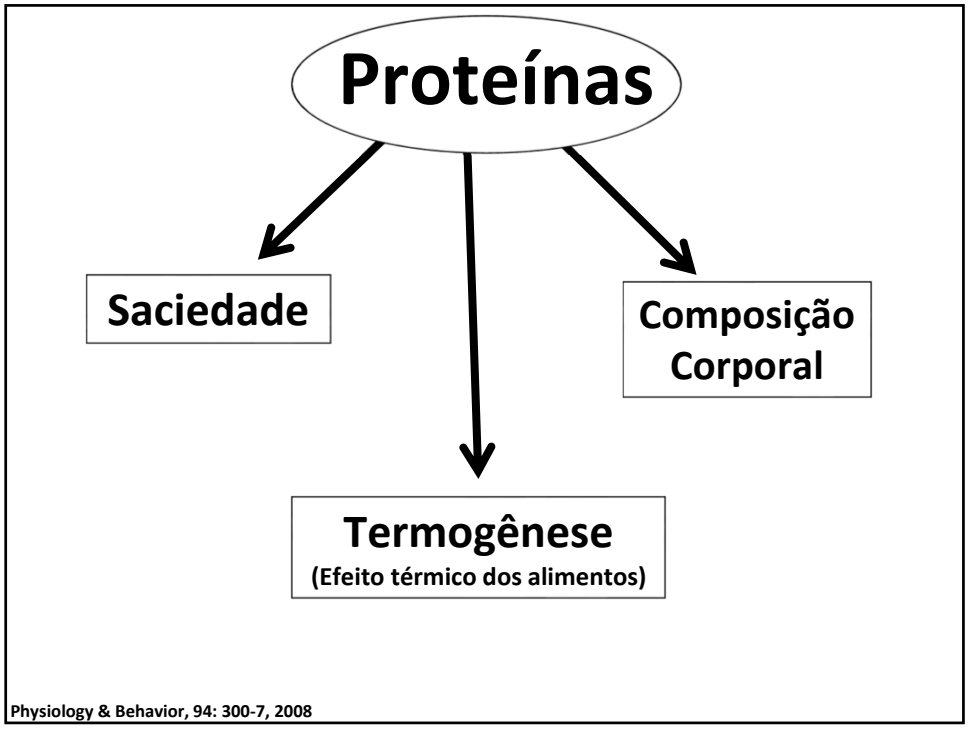


35

Distribuição de Macronutrientes

36



Physiology & Behavior, 94: 300-7, 2008

37

SACIEDADE

Proteínas > Carboidratos > Lipídios

Curr Opin Clin Nutr Metab Care (2003), 6, 635-638

Nutrition Research Reviews (2012), 25, 29-39

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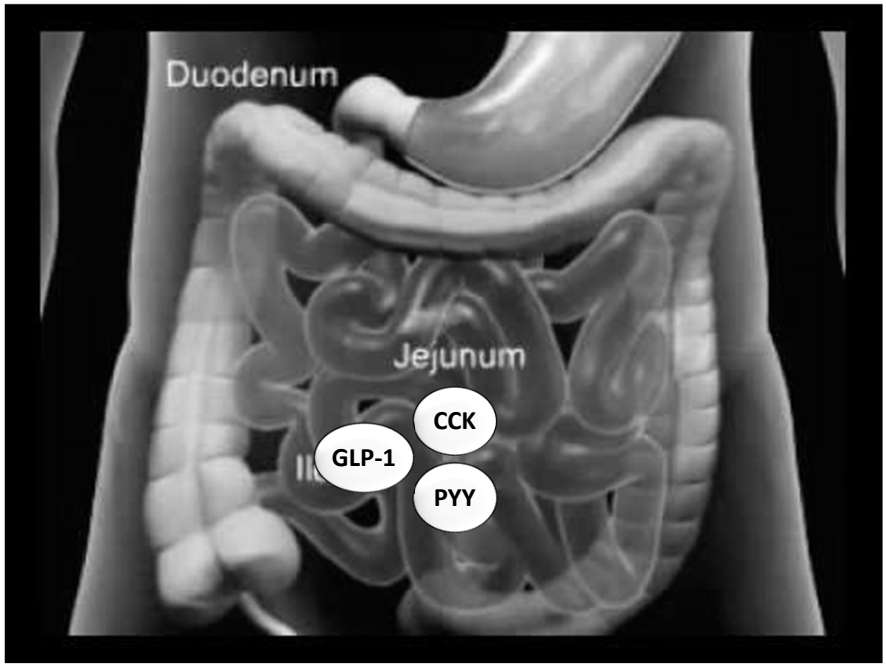

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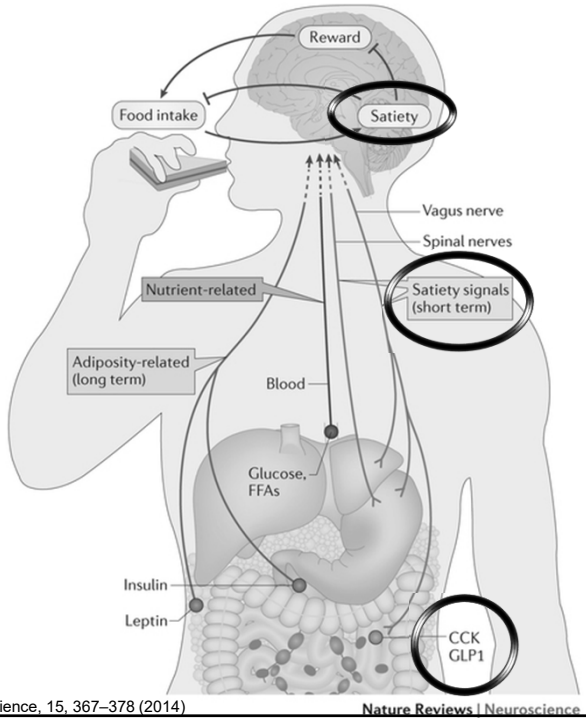
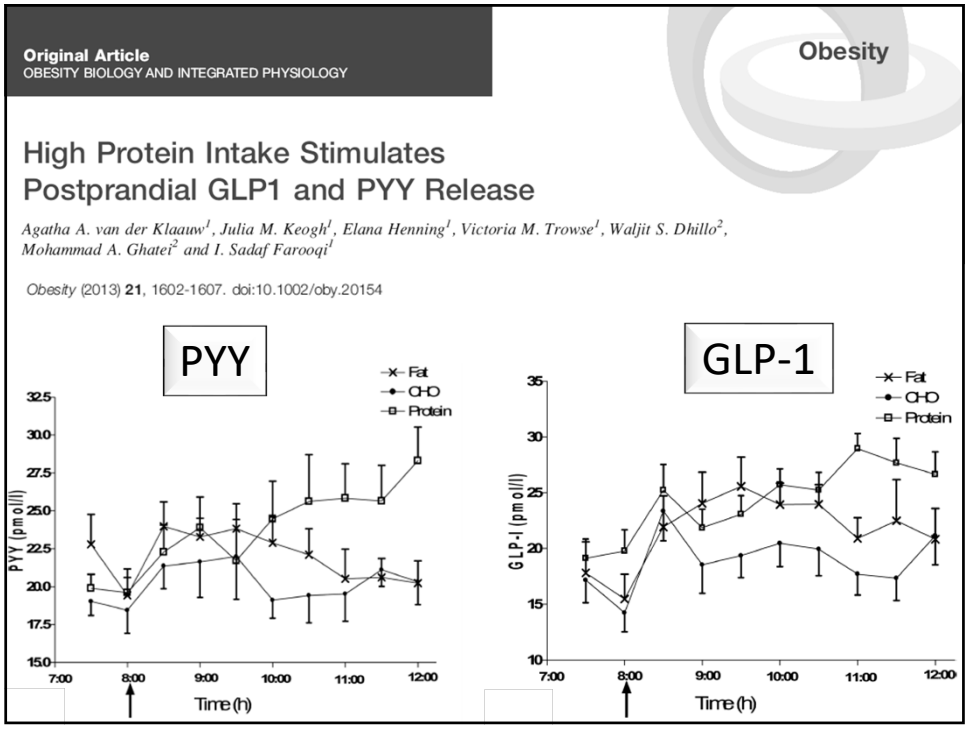
CCK, GLP1 e Saciedade

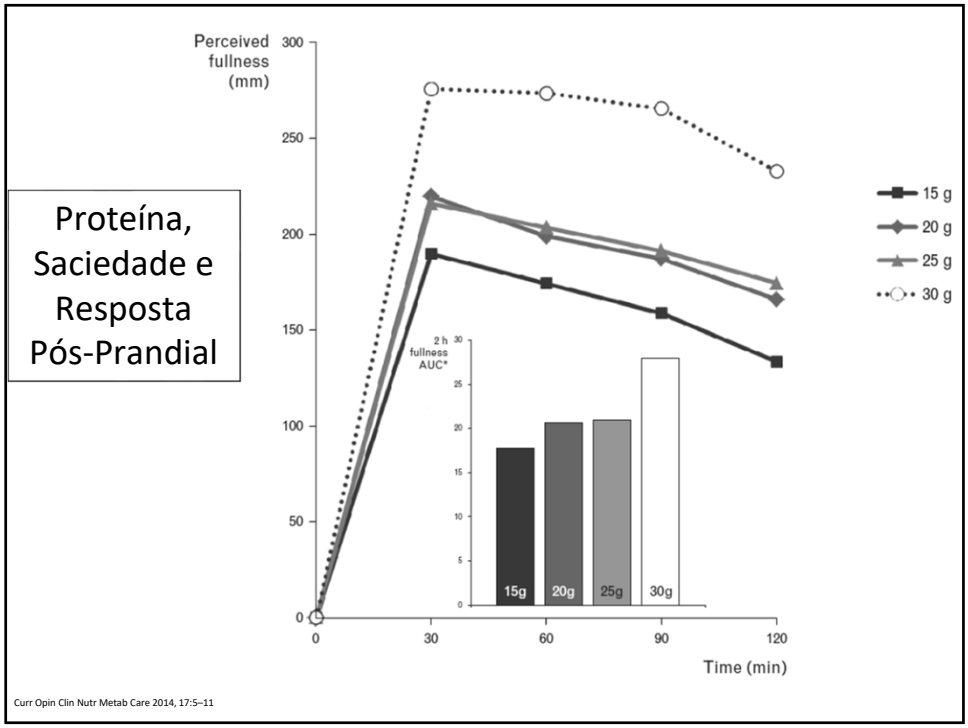


Nature Reviews Neuroscience, 15, 367–378 (2014)

40


Original Article
OBESITY BIOLOGY AND INTEGRATED PHYSIOLOGY
Obesity
High Protein Intake Stimulates Postprandial GLP1 and PYY Release
Agatha A. van der Klaauw[1], Julia M. Keogh[1], Elana Henning[1], Victoria M. Trowse[1], Waljit S. Dhillo[2], Mohammad A. Ghatei[2] and I. Sadaf Farooqi[1]
Obesity (2013) 21, 1602-1607. doi:10.1002/oby.20154
PYY
GLP-1
Fat
CHO
Protein
PYY (pmol/l)
GLP-1 (pmol/l)
Time (h)

41


Proteína, Saciedade e Resposta Pós-Prandial
Perceived fullness (mm)
15 g
20 g
25 g
30 g
2 h fullness AUC*
15g
20g
25g
30g
Time (min)
Curr Opin Clin Nutr Metab Care 2014, 17:5–11

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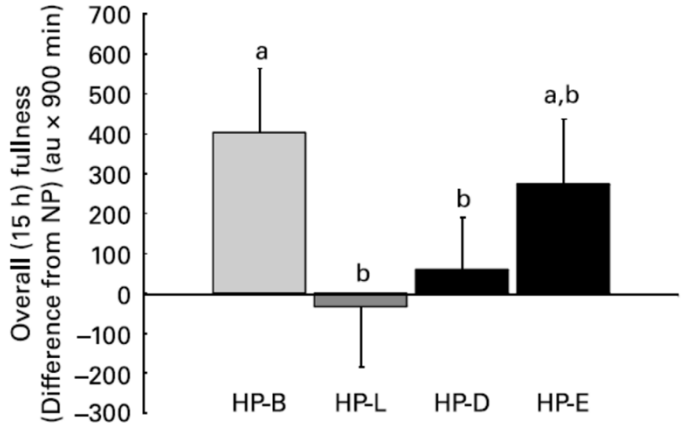
Breakfast Skipping

43

British Journal of Nutrition (2009), **101**, 798–803
doi:10.1017/S0007114508051532

Short Communication

Increased dietary protein consumed at breakfast leads to an initial and sustained feeling of fullness during energy restriction compared to other meal times



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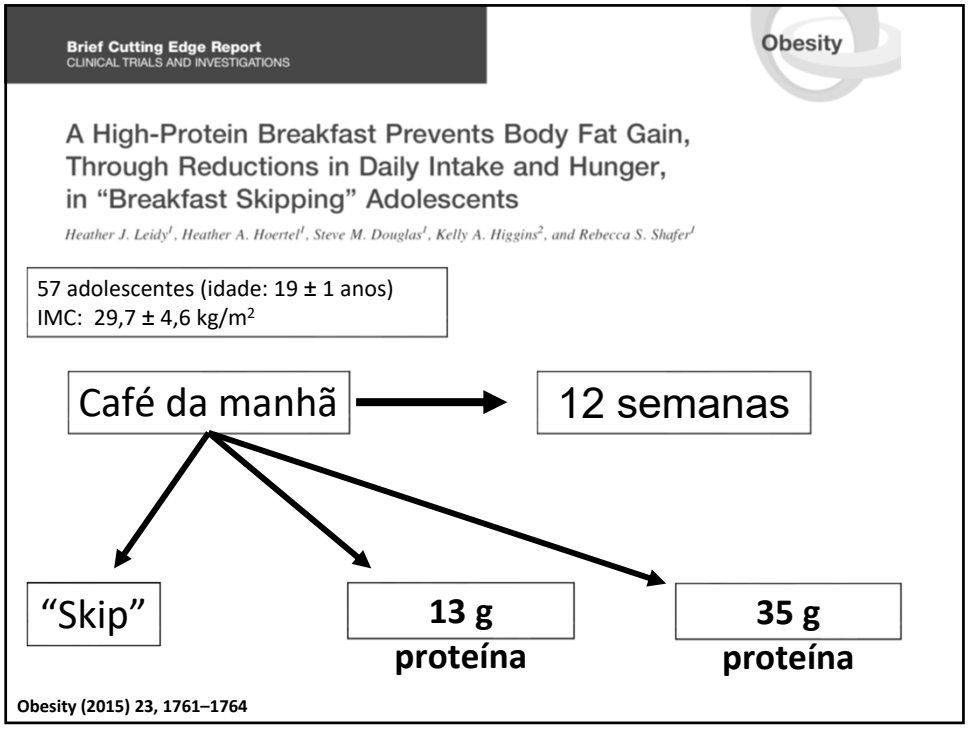
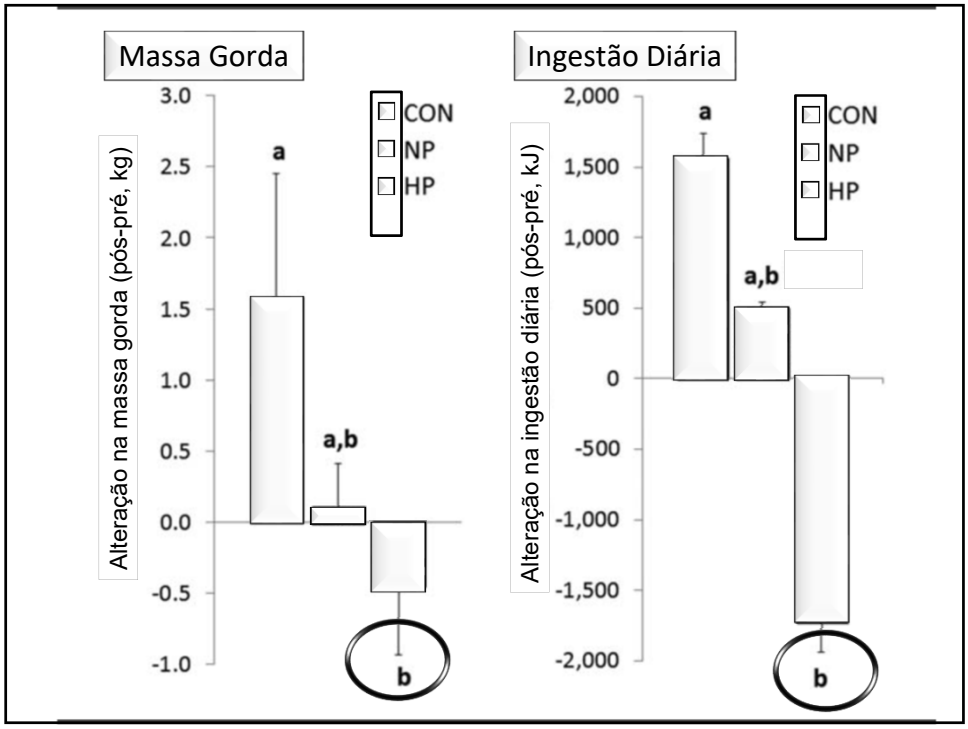
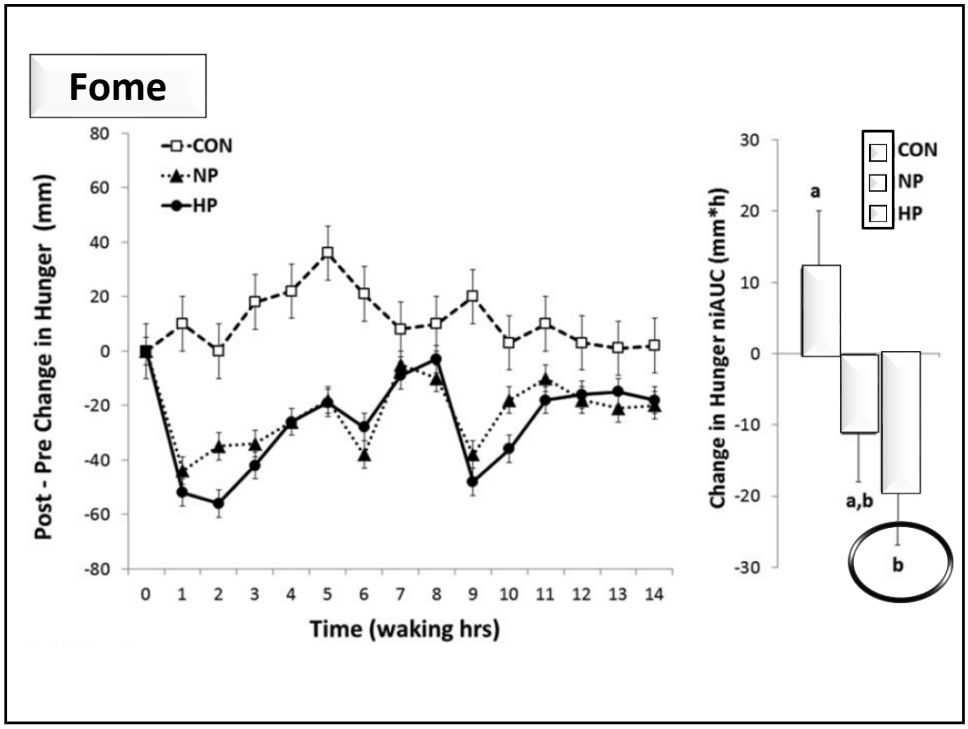

Brief Cutting Edge Report
CLINICAL TRIALS AND INVESTIGATIONS
Obesity
A High-Protein Breakfast Prevents Body Fat Gain, Through Reductions in Daily Intake and Hunger, in "Breakfast Skipping" Adolescents
Heather J. Leidy[1], Heather A. Hoertel[1], Steve M. Douglas[1], Kelly A. Higgins[2], and Rebecca S. Shafer[1]
57 adolescentes (idade: 19 ± 1 anos)
IMC: 29,7 ± 4,6 kg/m2
Café da manhã
12 semanas
"Skip"
13 g proteína
35 g proteína
Obesity (2015) 23, 1761–1764

45


Massa Gorda
Alteração na massa gorda (pós-pré, kg)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
a
a,b
b
CON
NP
HP
Ingestão Diária
Alteração na ingestão diária (pós-pré, kJ)
2,000
1,500
1,000
500
0
-500
-1,000
-1,500
-2,000
a
a,b
b
CON
NP
HP

46


Fome
CON
NP
HP
Post - Pre Change in Hunger (mm)
Time (waking hrs)
Change in Hunger niAUC (mm*h)
a
a,b
b

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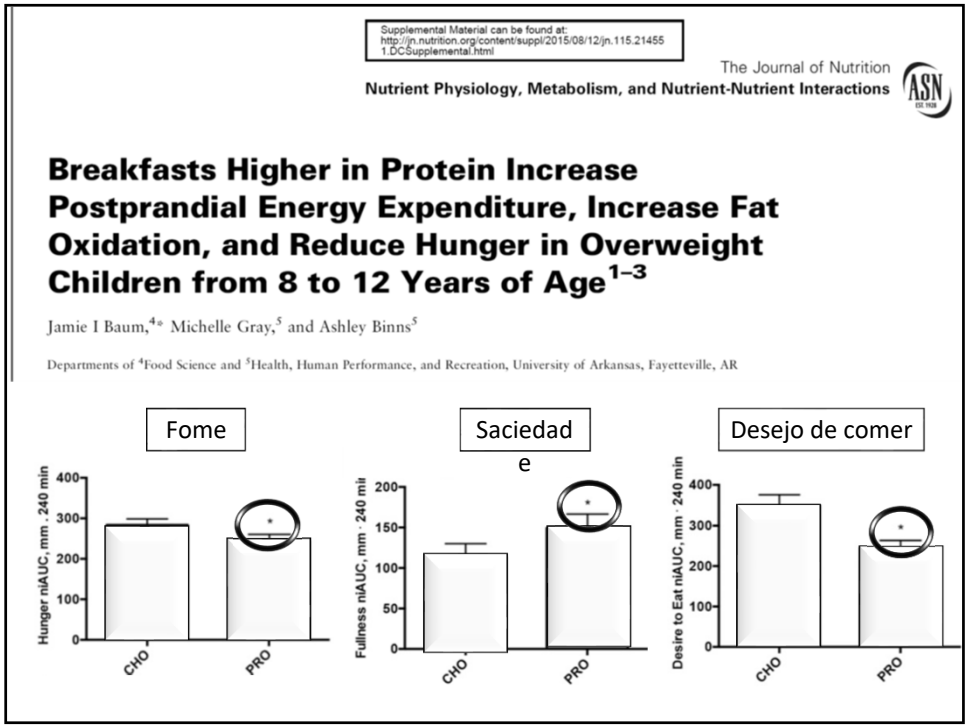
Supplemental Material can be found at:
http://jn.nutrition.org/content/suppl/2015/08/12/jn.115.214551.DCSupplemental.html
The Journal of Nutrition
Nutrient Physiology, Metabolism, and Nutrient-Nutrient Interactions
Breakfasts Higher in Protein Increase Postprandial Energy Expenditure, Increase Fat Oxidation, and Reduce Hunger in Overweight Children from 8 to 12 Years of Age[1–3]
Jamie I Baum,[4]* Michelle Gray,[5] and Ashley Binns[5]
Departments of [4]Food Science and [5]Health, Human Performance, and Recreation, University of Arkansas, Fayetteville, AR
Fome
Saciedade
Desejo de comer
Hunger niAUC, mm · 240 min
Fullness niAUC, mm · 240 min
Desire to Eat niAUC, mm · 240 min
CHO
PRO

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Metabolismo Proteico e Termogênese

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Efeito Térmico dos Alimentos

5 - 10% GET

Proteína: 20 - 35%

Carboidrato: 5 - 15%

Lipídos: 0 - 5%

J Am Coll Nutr. 2004; 23:373-85 Nutr Rev. 1989; 47(5):129-37 Int J Obes. 1999; 23(3):287-92

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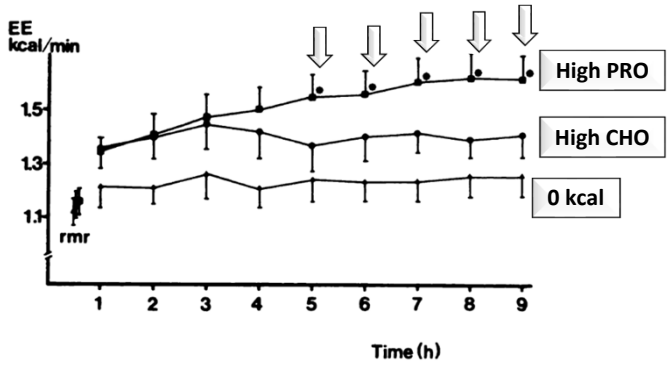
Gasto Energético



Am J Clin Nutr, 1990; 52, 72-80

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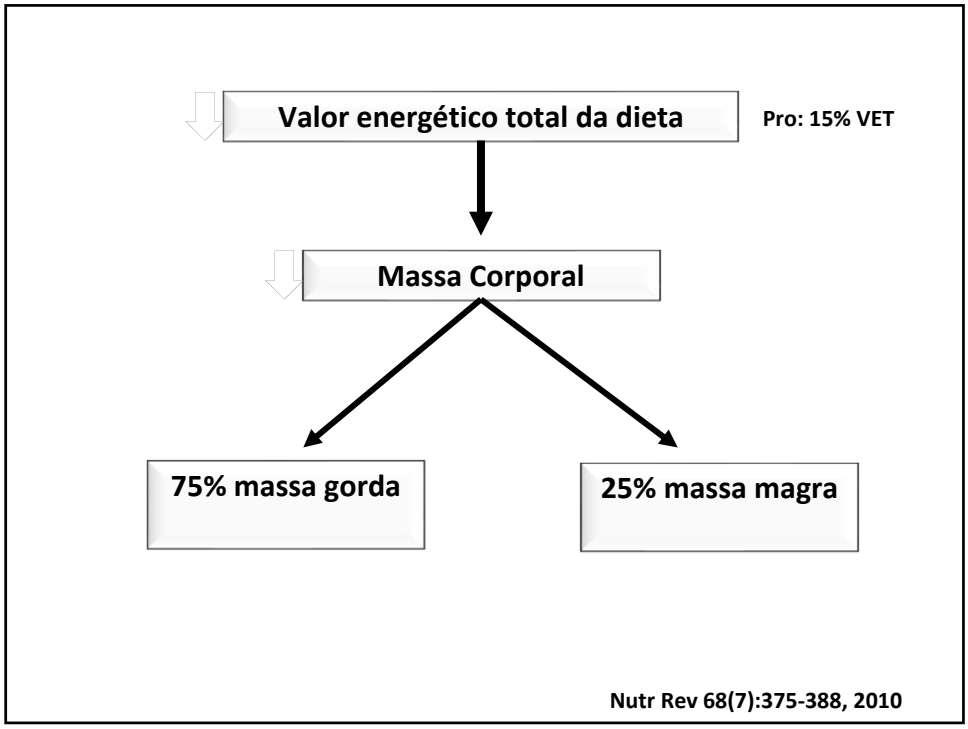
Proteínas e Composição Corporal

52


Valor energético total da dieta
Pro: 15% VET
Massa Corporal
75% massa gorda
25% massa magra
Nutr Rev 68(7):375-388, 2010

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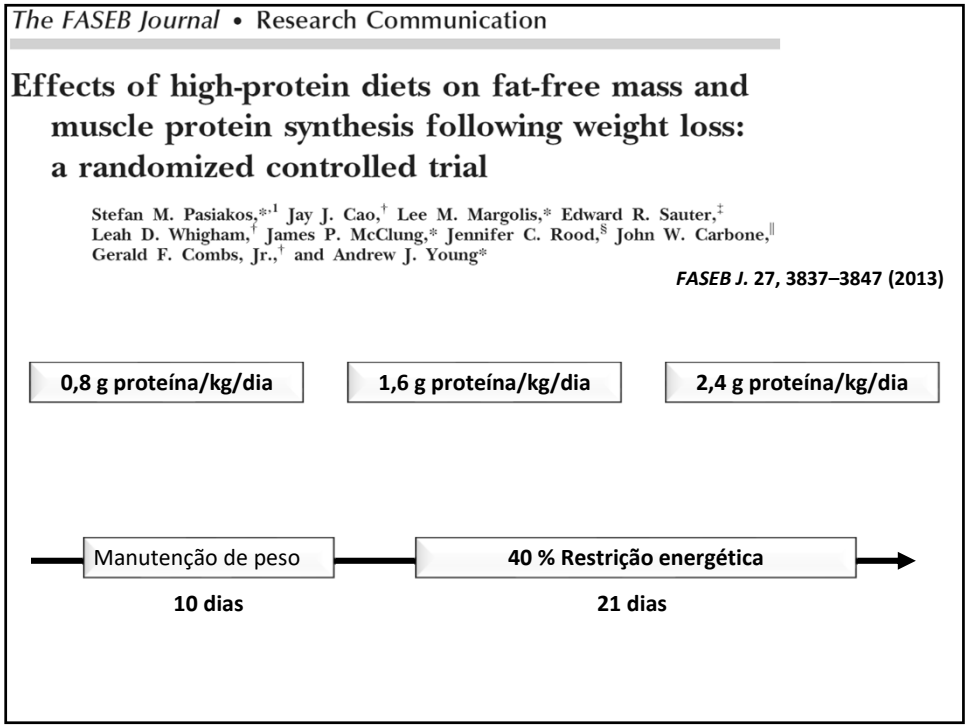
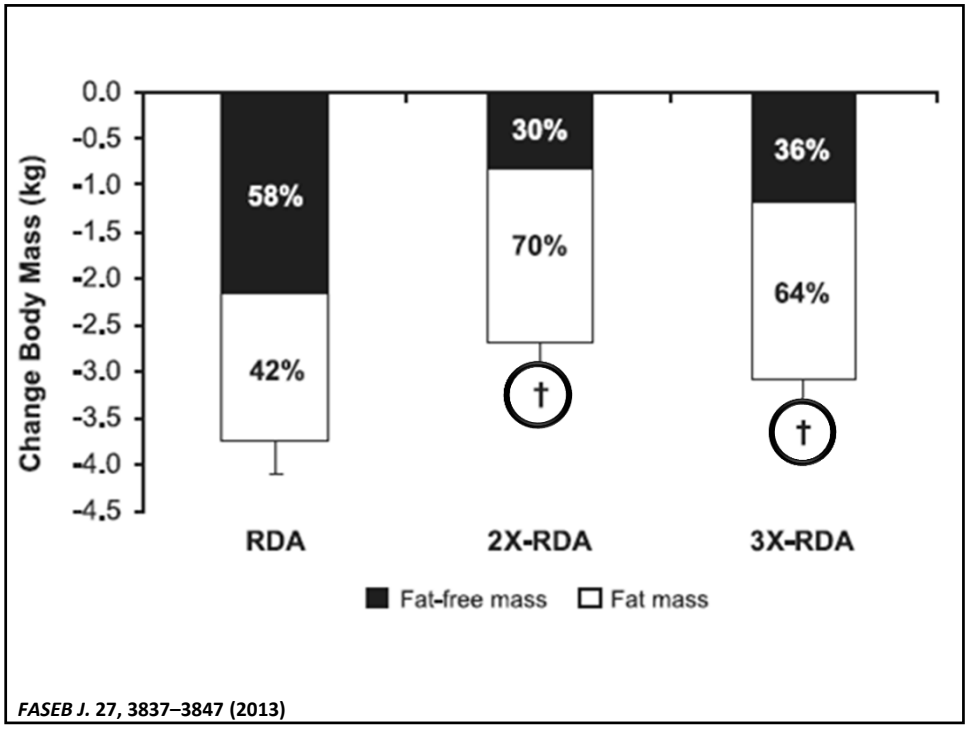

The FASEB Journal • Research Communication
Effects of high-protein diets on fat-free mass and muscle protein synthesis following weight loss: a randomized controlled trial
Stefan M. Pasiakos,*,1 Jay J. Cao,† Lee M. Margolis,* Edward R. Sauter,‡ Leah D. Whigham,† James P. McClung,* Jennifer C. Rood,§ John W. Carbone,‖ Gerald F. Combs, Jr.,† and Andrew J. Young*
FASEB J. 27, 3837–3847 (2013)
0,8 g proteína/kg/dia
1,6 g proteína/kg/dia
2,4 g proteína/kg/dia
Manutenção de peso
10 dias
40 % Restrição energética
21 dias

54



FASEB J. 27, 3837–3847 (2013)

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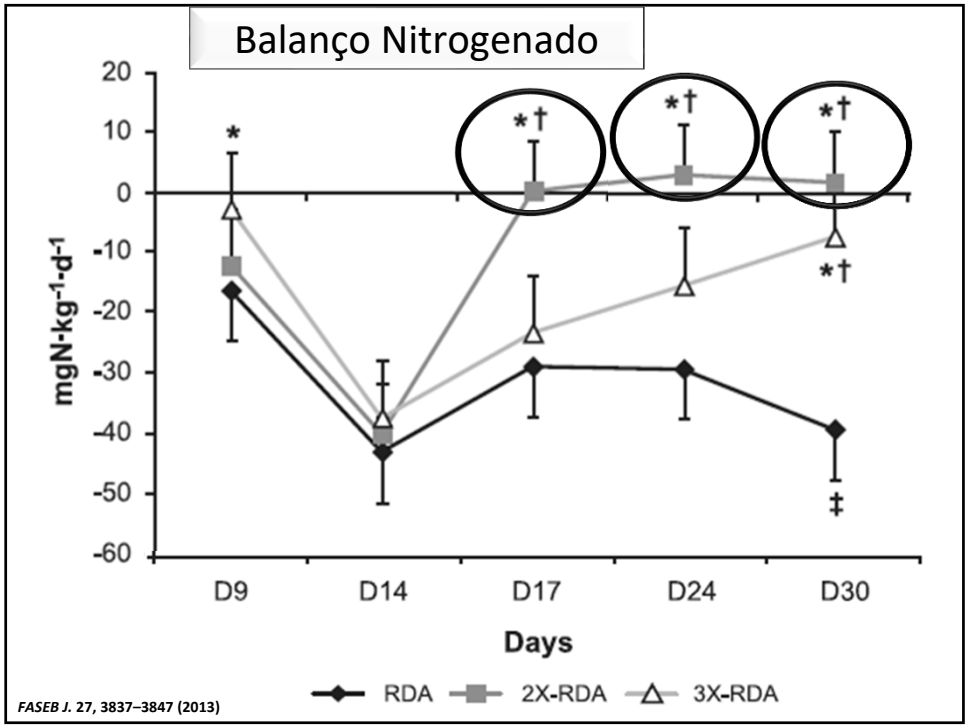

FASEB J. 27, 3837–3847 (2013)

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The Journal of Nutrition
Nutrient Physiology, Metabolism, and Nutrient-Nutrient Interactions

J. Nutr. 141: 1626–1634, 2011

Increased Consumption of Dairy Foods and Protein during Diet- and Exercise-Induced Weight Loss Promotes Fat Mass Loss and Lean Mass Gain in Overweight and Obese Premenopausal Women[1–4]

Andrea R. Josse,[5] Stephanie A. Atkinson,[6] Mark A. Tarnopolsky,[7] and Stuart M. Phillips[5]*

Participantes

IMC: 27 - 40 kg/m²

Idade: 19 - 45 anos

Dieta: - 500 Kcal

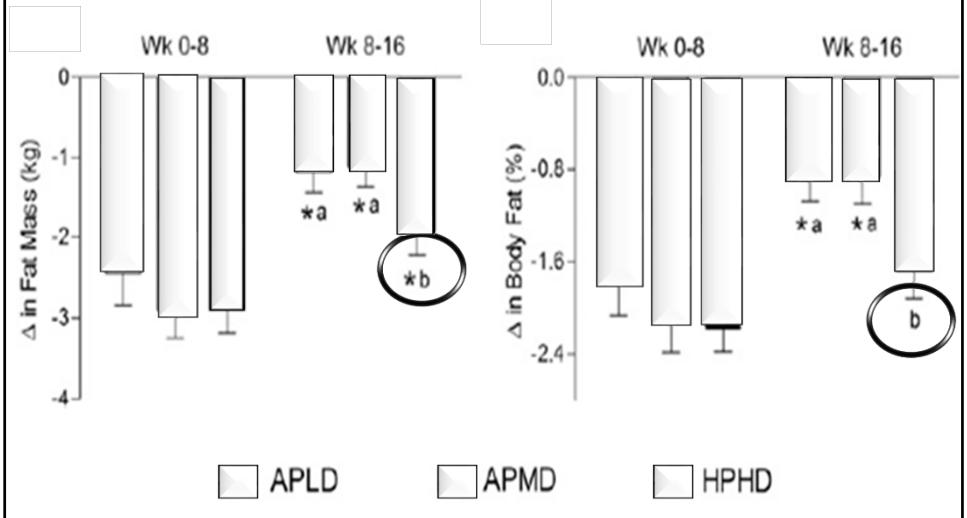
Exercício: - 250 Kcal

% VCT proteína		% VCT proteína oriunda de leite e derivados	
30%	**HPHD**	15%	**1,33 g/(kg.d)**
15%	**APMD**	7,5%	**0,84 g/(kg.d)**
15%	**APLD**	< 2%	**0,72 g/(kg.d)**

57

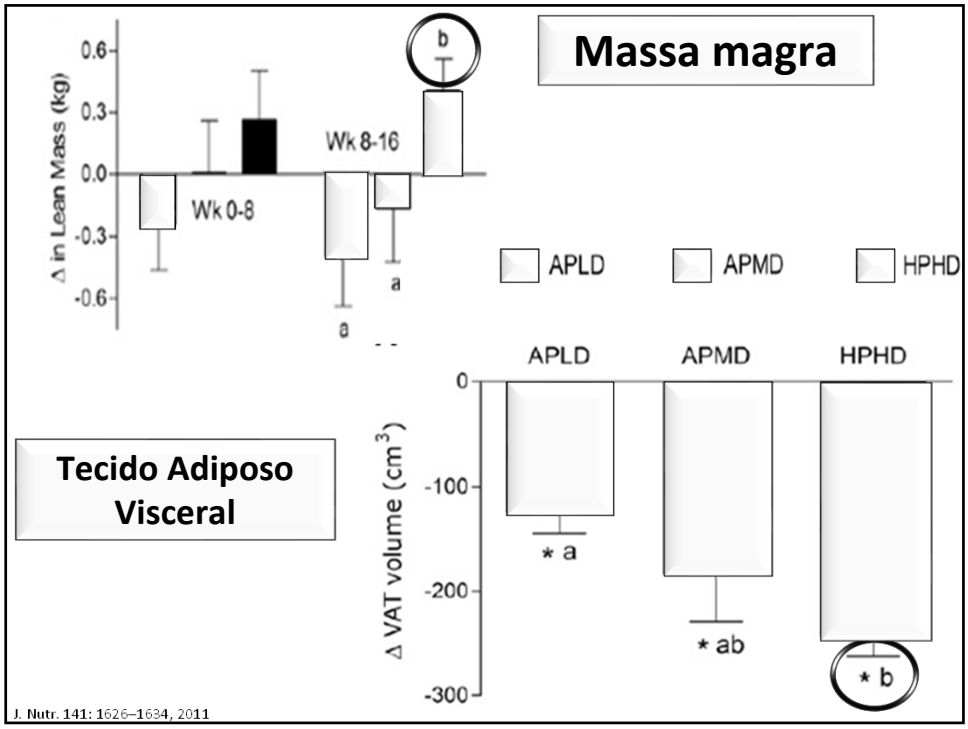
Massa gorda

% Gordura Corporal



J. Nutr. 141: 1626–1634, 2011

58



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nutrients

MDPI

Article

Effects of Adherence to a Higher Protein Diet on Weight Loss, Markers of Health, and Functional Capacity in Older Women Participating in a Resistance-Based Exercise Program

Melyn Galbreath [1], Bill Campbell [2], Paul La Bounty [3], Jennifer Bunn [4], Jacqueline Dove [5], Travis Harvey [6], Geoffrey Hudson [7], Jean L. Gutierrez [8], Kyle Levers [9], Elfego Galvan [10], Andrew Jagim [11], Lori Greenwood [12], Matthew B. Cooke [13], Mike Greenwood [12], Chris Rasmussen [12] and Richard B. Kreider [12,*]

Variable	E	HC	HP
Age (years)	66.0 ± 4.3	63.3 ± 4.8	65.5 ± 5.2
Weight (kg)	76.0 ± 9.5	78.6 ± 10.7	81.6 ± 11.4
Height (cm)	159.6 ± 3.7	161.3 ± 4.9	161.7 ± 6.8
BMI (kg/m^2)	29.9 ± 4.1	30.3 ± 4.0	31.3 ± 4.2
Body fat (%)	42.7 ± 3.7	44.2 ± 3.5	43.6 ± 3.7

Nutrients **2018**, *10*, 1070; doi:10.3390/nu10081070

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nutrients

MDPI

Article

Effects of Adherence to a Higher Protein Diet on Weight Loss, Markers of Health, and Functional Capacity in Older Women Participating in a Resistance-Based Exercise Program

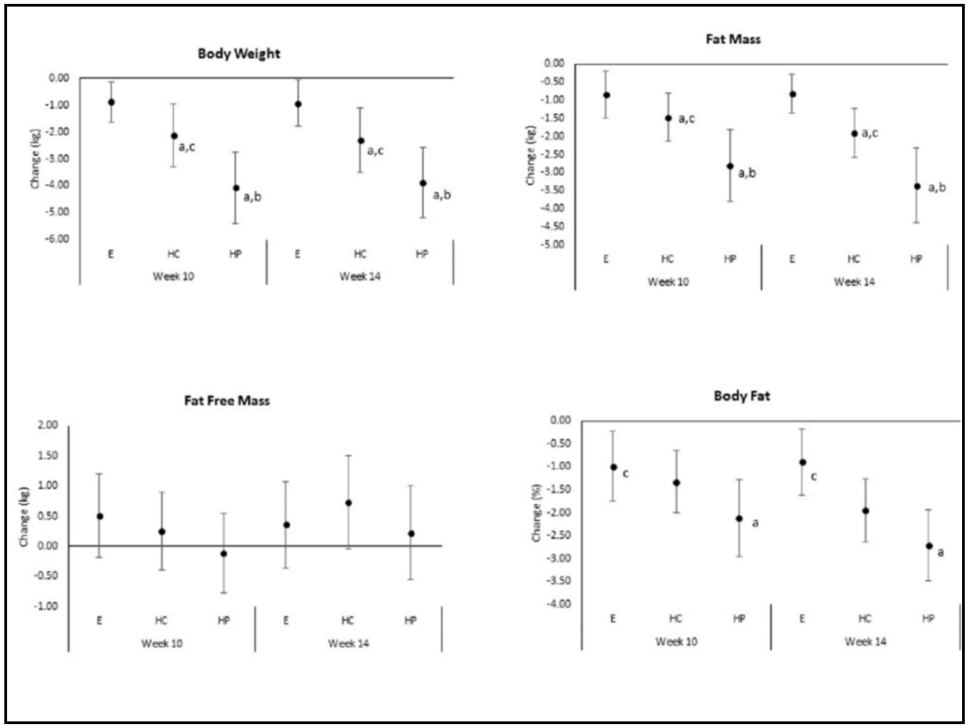
Melyn Galbreath [1], Bill Campbell [2], Paul La Bounty [3], Jennifer Bunn [4], Jacqueline Dove [5], Travis Harvey [6], Geoffrey Hudson [7], Jean L. Gutierrez [8], Kyle Levers [9], Elfego Galvan [10], Andrew Jagim [11], Lori Greenwood [12], Matthew B. Cooke [13], Mike Greenwood [12], Chris Rasmussen [12] and Richard B. Kreider [12,*]

1200 kcal/d for 1 week (Phase I)

1600 kcal/d for 9-weeks (Phase II)

HC diet	HP diet
55% CHO 15% PRO 30% LIP	1,2 g Pro/kg/d 30% LIP

61



62

Effects of energy-restricted high-protein, low-fat compared with standard-protein, low-fat diets: a meta-analysis of randomized controlled trials[1–3]

Thomas P Wycherley, Lisa J Moran, Peter M Clifton, Manny Noakes, and Grant D Brinkworth

Am J Clin Nutr 2012;96:1281–98. Printed in USA. © 2012 American Society for Nutrition

High-Protein Diet

24 estudos

1.063 indivíduos (IMC > 25 kg/m^2)

Duração: 12 ± 9 semanas

Proteína: 27-35% VCT

1,07–1,60 g/kg peso/dia

↓ Massa corporal

↓ Massa gorda

↓ TAG plasmático

↑ Saciedade

Atenua perda de massa magra

63

AJCN. First published ahead of print April 29, 2015 as doi: 10.3945/ajcn.114.084038.

The role of protein in weight loss and maintenance[1–5]

Heather J Leidy, Peter M Clifton, Arne Astrup, Thomas P Wycherley, Margriet S Westerterp-Plantenga, Natalie D Luscombe-Marsh, Stephen C Woods, and Richard D Mattes

Quantidade de Proteína

1,2 - 1,6 g proteína/kg de peso/dia

25- 30 g proteína/refeição

Am J Clin Nutr, 101: 1320S-1329S, 2015

64

Carboidratos

45% – 60% do VCT

65

Fibras Alimentares

20 g – 30 g/dia

66

Efeitos Fisiológicos das Fibras Alimentares

- Colesterol Total e LDL-col
- Controle Glicêmico e insulinêmico
- Função Intestinal
- Prebióticos
- Saciedade

67

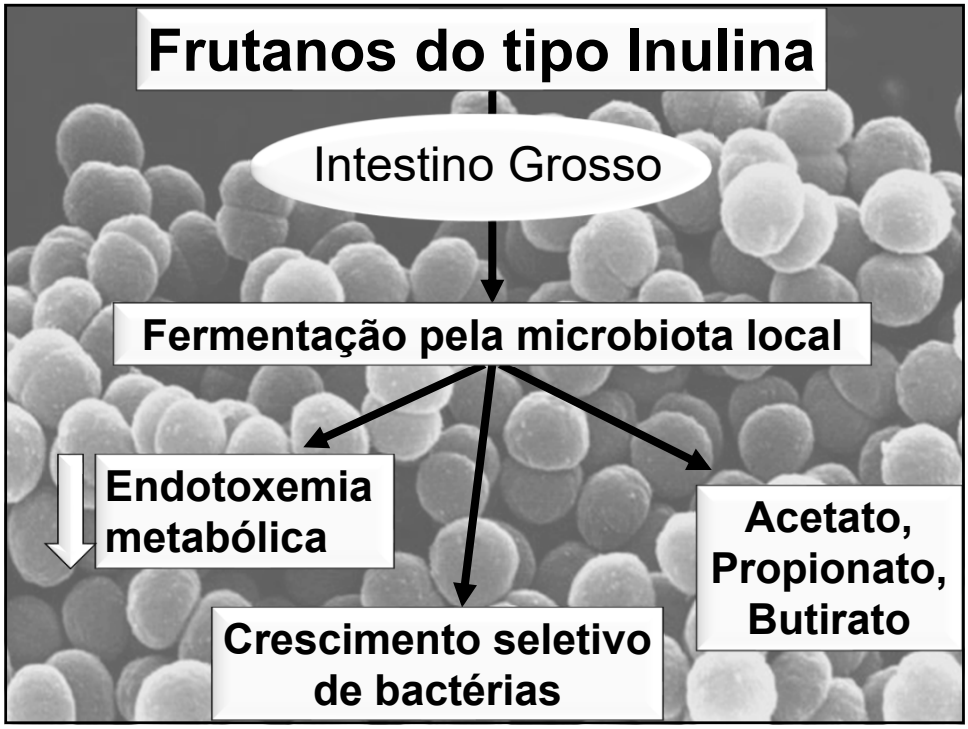
Frutanos do Tipo Inulina

68

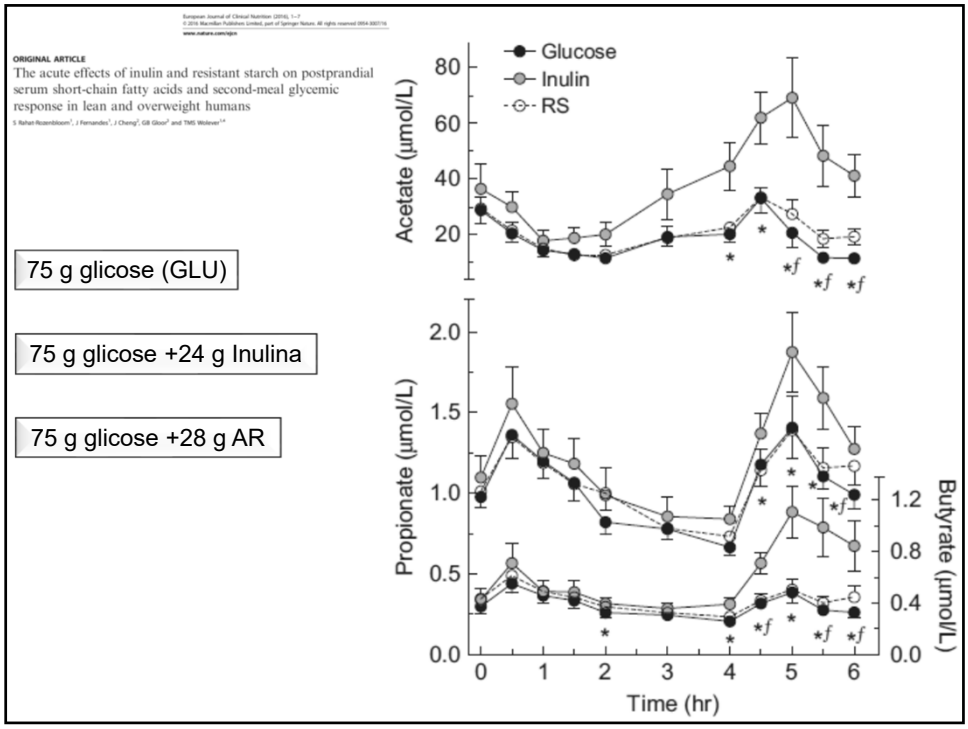
Frutanos do tipo Inulina

British Journal of Nutrition (2002), 87, Suppl. 2, S139–S143

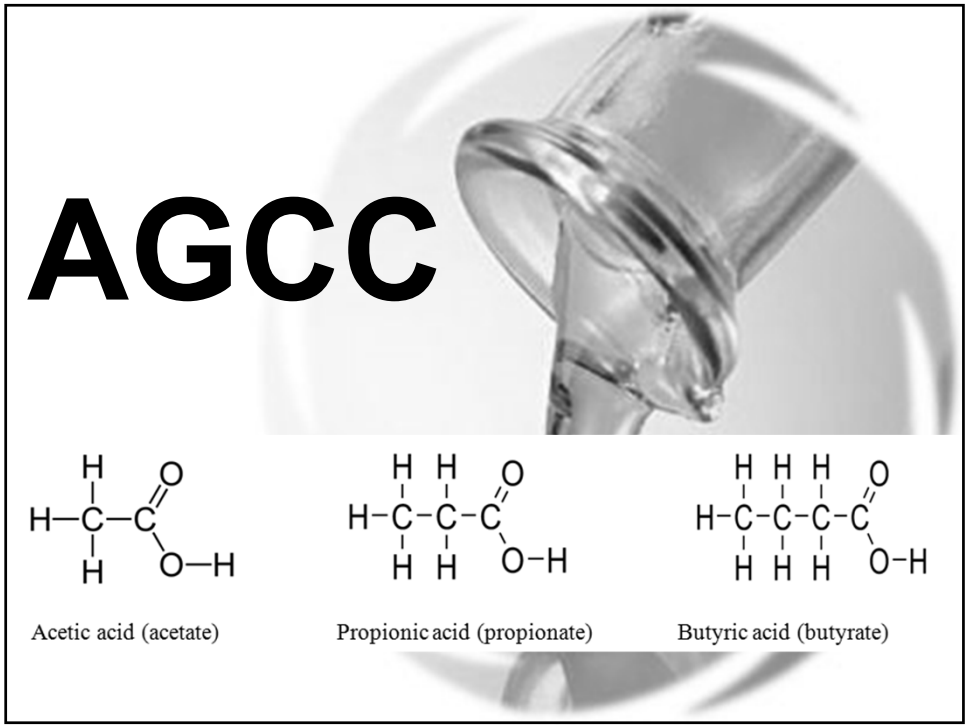
69



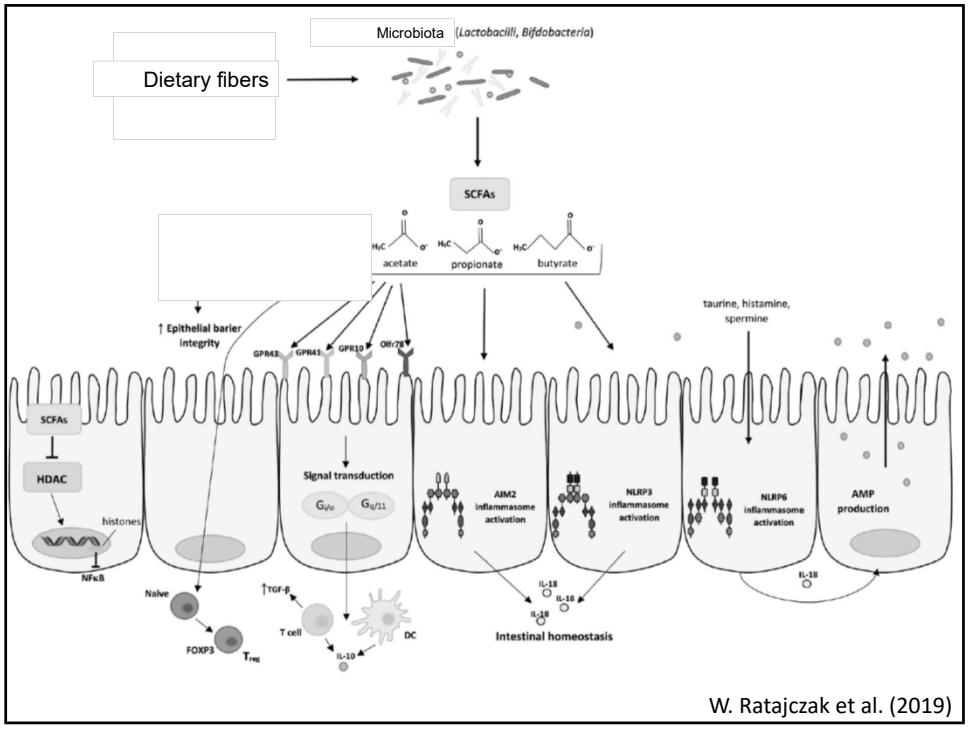
70


ORIGINAL ARTICLE
The acute effects of inulin and resistant starch on postprandial serum short-chain fatty acids and second-meal glycemic response in lean and overweight humans
75 g glicose (GLU)
75 g glicose +24 g Inulina
75 g glicose +28 g AR
Glucose
Inulin
RS
Acetate (µmol/L)
Propionate (µmol/L)
Butyrate (µmol/L)
Time (hr)

71

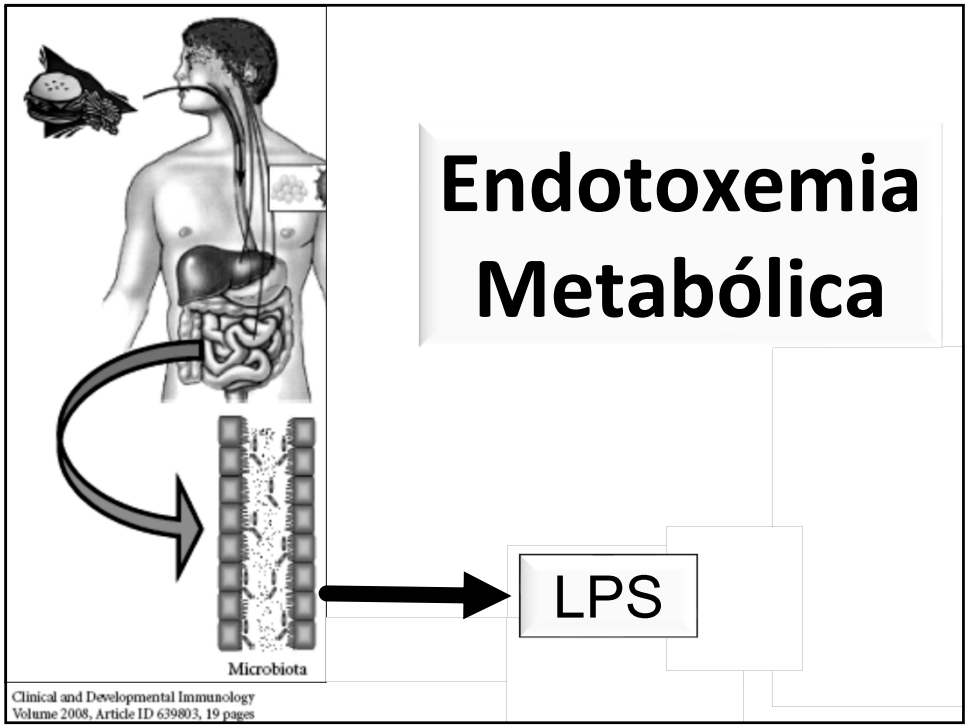

AGCC
Acetic acid (acetate)
Propionic acid (propionate)
Butyric acid (butyrate)

72



W. Ratajczak et al. (2019)

73



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Nutrition 30 (2014) 418–423

Contents lists available at ScienceDirect

Nutrition

journal homepage: www.nutritionjrnl.com

Applied nutritional investigation

Oligofructose-enriched inulin improves some inflammatory markers and metabolic endotoxemia in women with type 2 diabetes mellitus: A randomized controlled clinical trial

52 mulheres
DM tipo 2
IMC: 25-35 kg/m²

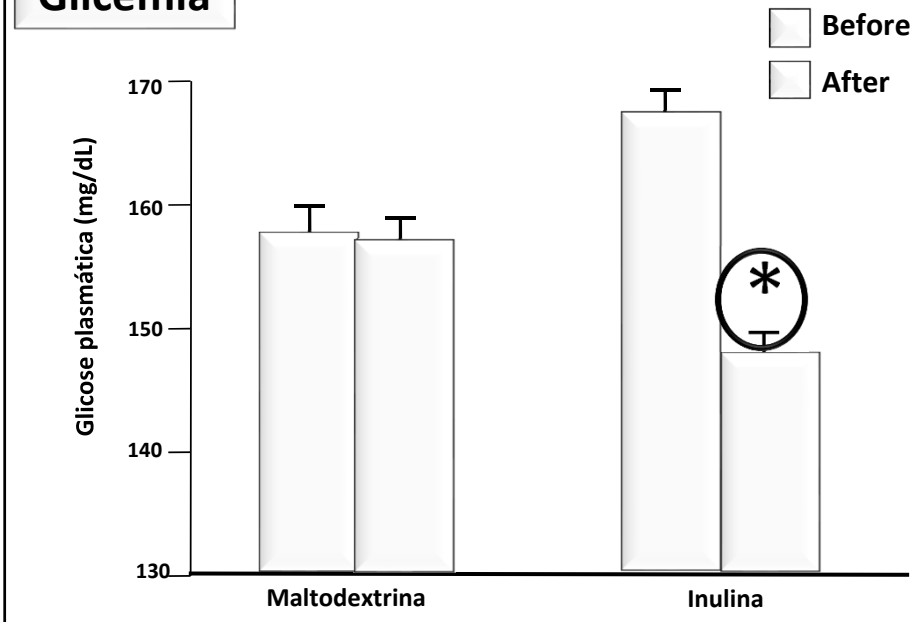
8 semanas

10 g/dia Inulina enriquecida com Oligofrutose (n=27)

10 g/dia maltodextrina (n=25)

75

Glicemia



* p< 0,05

Nutrition 30 (2014) 418–423

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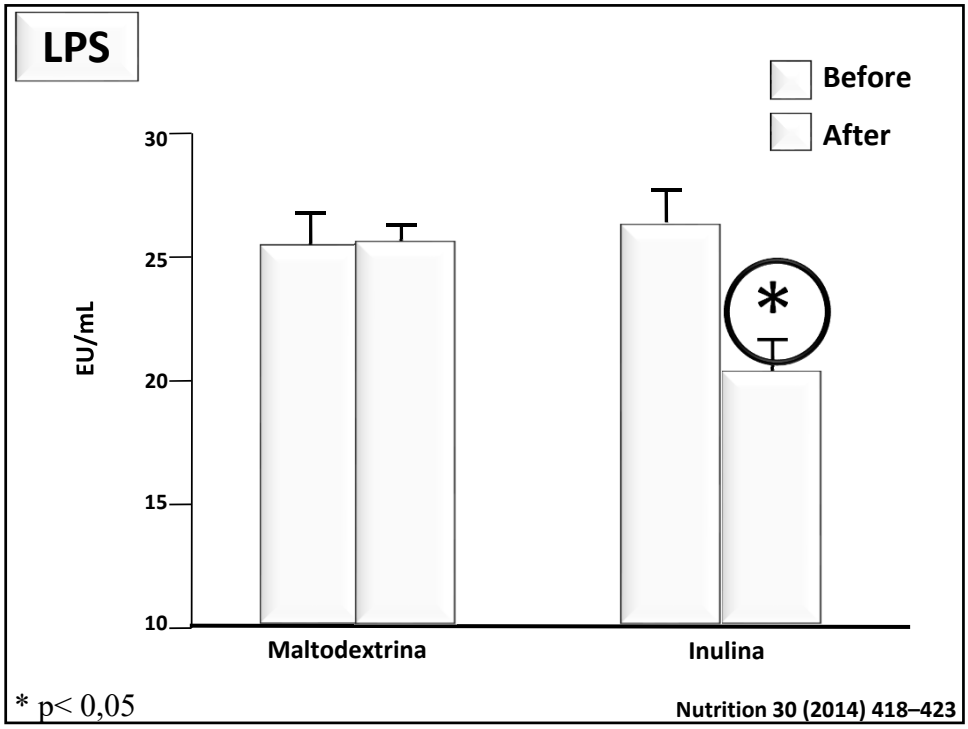

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Frutanos do Tipo Inulina e Saciedade

78

European Journal of Clinical Nutrition (2006) 60, 567–572
© 2006 Nature Publishing Group All rights reserved 0954-3007/06 $30.00
www.nature.com/ejcn

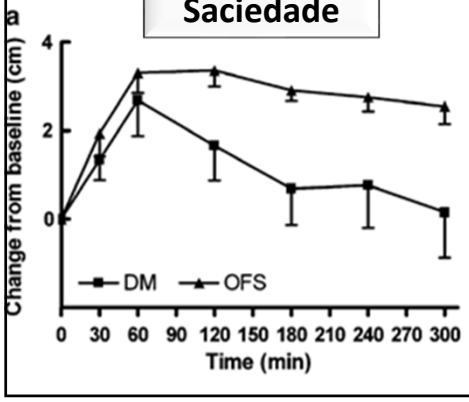
ORIGINAL ARTICLE

Oligofructose promotes satiety in healthy human: a pilot study

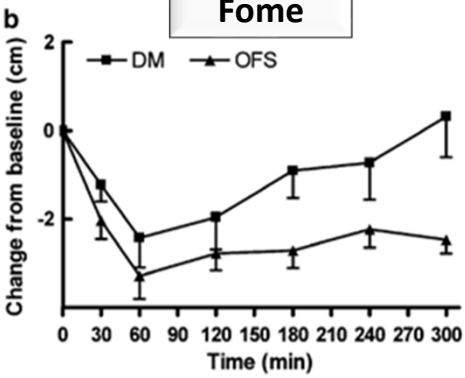
PD Cani[1], E Joly[1], Y Horsmans[2] and NM Delzenne[1]

16 g oligofrutose/dia

Saciedade



Fome



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Lipídios

20% – 30% das calorias totais

Ácidos graxos saturados

< 10% das calorias totais

Recomendar até 7% se [LDL-colesterol] for > 100 mg/dL

↑ 1% VCT como AGS → ↑ 2% concentração COL plasma

ABESO, 2016

80

Ácidos graxos Poliinsaturados

Até 10% das calorias totais

Arquivos Brasileiros de Cardiologia - Volume 84, Suplemento I, Abril 2005

81

82

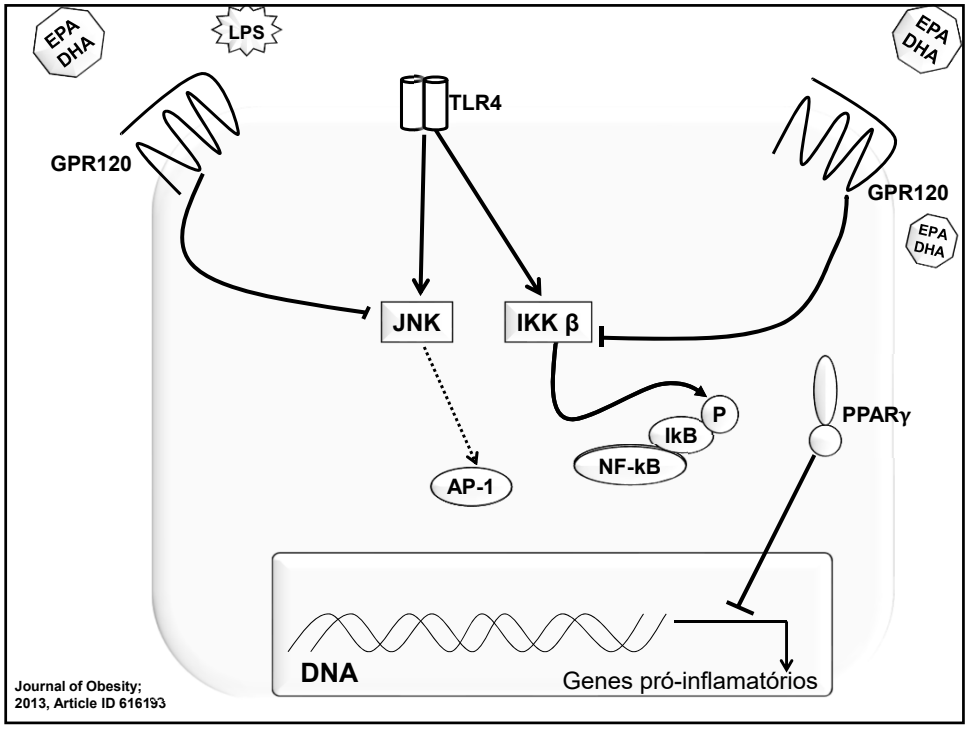
α-Linolênico

EPA e DHA

83

100g	EPA + DHA (g)	Alfa linolênico (%)
Cavala	2,5	-
Sardinha	1,7	-
Arenque	1,6	-
Salmão	1,0	-
Truta	0,5	-
Bacalhau	0,2	-
Óleo de canola	-	9,0
Óleo de soja	-	7,08

84

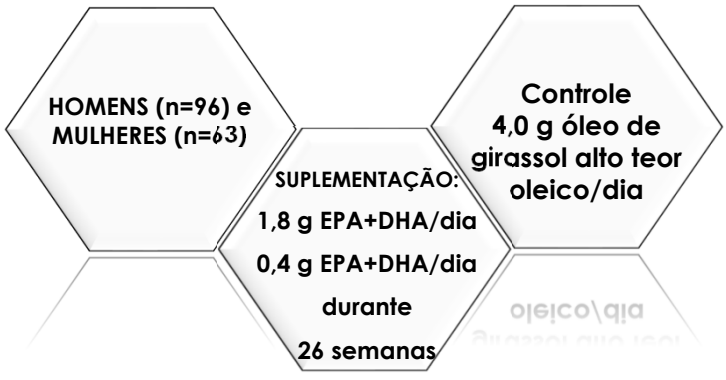


85

Fish-oil supplementation induces antiinflammatory gene expression profiles in human blood mononuclear cells[1–3]

Mark Bouwens, Ondine van de Rest, Neele Dellschaft, Mechteld Grootte Bromhaar, Lisette CPGM de Groot, Johanna M Geleijnse, Michael Müller, and Lydia A Afman

Am J Clin Nutr 2009;90:415–24. Printed in USA. © 2009 American Society for Nutrition



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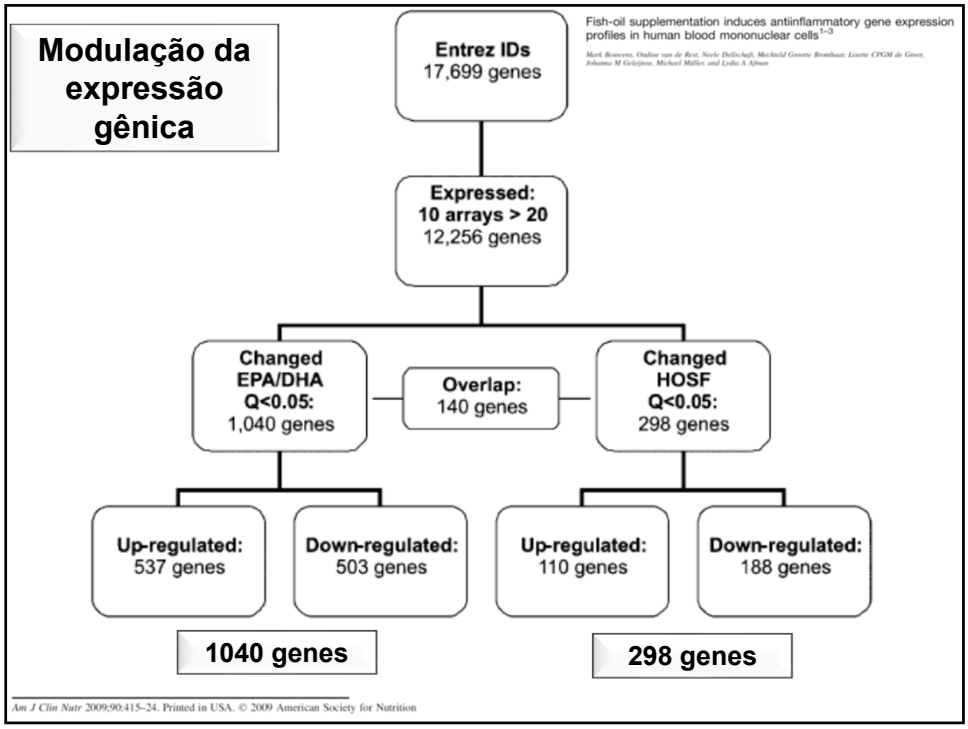

87

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Am J Clin Nutr 2009;90:415–24. Printed in USA. © 2009 American Society for Nutrition

Inflammatory signaling

Process	Gene name	Description	Entrez ID	Mean FC EPADHA	EPADHA: q-value	MUFA: q-value
Inflammation						
inflammatory signaling						
	CEBPB	CCAAT/enhancer binding protein (C/EBP), beta	1051	-1.11		0.24485
	DUSP1	dual specificity phosphatase 1	1843	-1.15		0.66208
	DUSP2	dual specificity phosphatase 2	1844	-1.50		
	MKNK1	MAP kinase interacting serine/threonine kinase 1	8569	-1.06		0.12427
	OSM	oncostatin M	5008	-1.24		
	IL6ST	interleukin 6 signal transducer (gp130, oncostatin M receptor)	3572	-1.20		0.41621
	IL13RA1	interleukin 13 receptor, alpha 1	3597	-1.17		
	NFIL3	nuclear factor, interleukin 3 regulated	4783	-1.25		0.17716
	ETS2	v-ets erythroblastosis virus E26 oncogene homolog 2 (avian)	2114	-1.16		0.14611
	EIF4EBP1	eukaryotic translation initiation factor 4E binding protein 1	1978	-1.12		0.17847
	H3F3B	H3 histone, family 3B (H3.3B)	3021	-1.09		0.10052
	LILRB3	leukocyte immunoglobulin-like receptor, subfamily B (with TM and ITIM domains), member 3	11025	-1.11		0.13656
	LILRA2	leukocyte immunoglobulin-like receptor, subfamily A (with TM domain), member 2	11027	-1.15		
	LILRA5	leukocyte immunoglobulin-like receptor, subfamily A (with TM domain), member 5	353514	-1.32		0.17412
	C5AR1	complement component 5a receptor 1	728	-1.19		0.13402

88

EPA e DHA:

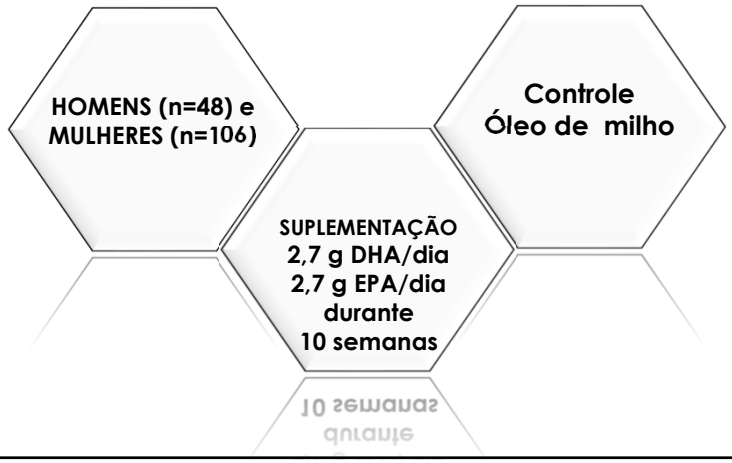
Efeitos similares?

89

A randomized, crossover, head-to-head comparison of eicosapentaenoic acid and docosahexaenoic acid supplementation to reduce inflammation markers in men and women: the Comparing EPA to DHA (ComparED) Study[1–3]

*Janie Allaire,[4] Patrick Couture,[4,5] Myriam Leclerc,[4] Amélie Charest,[4] Johanne Marin,[4] Marie-Claude Lépine,[4] Denis Talbot,[3,6] André Tchernof,[4,5,7] and Benoît Lamarche[4]**

Am J Clin Nutr 2016;104:280–7. Printed in USA. © 2016 American Society for Nutrition



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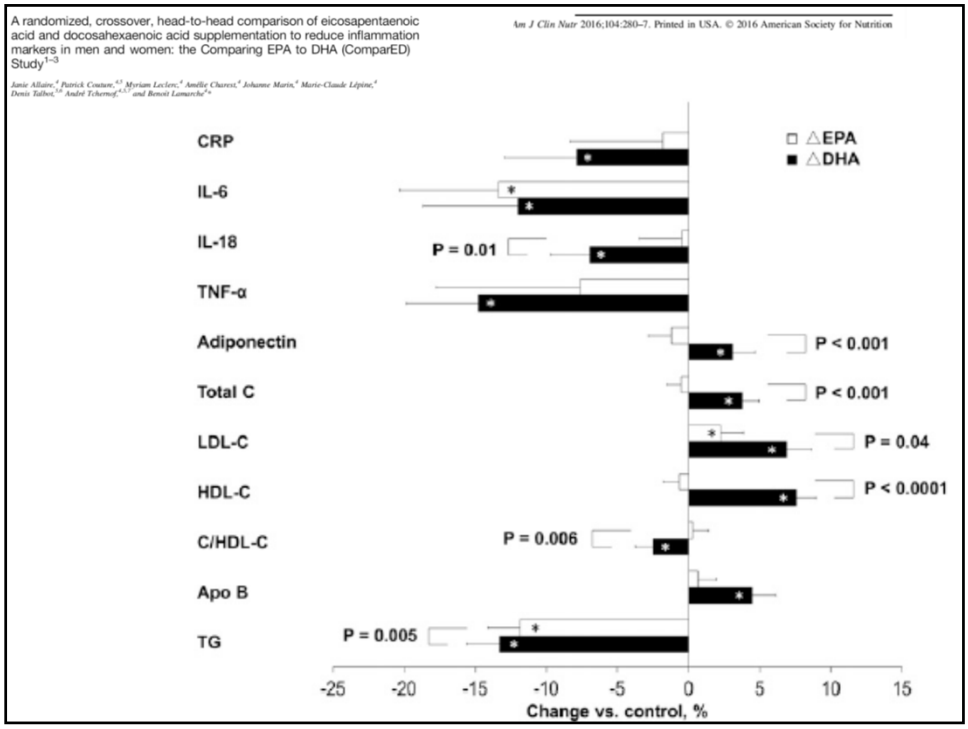
A randomized, crossover, head-to-head comparison of eicosapentaenoic acid and docosahexaenoic acid supplementation to reduce inflammation markers in men and women: the Comparing EPA to DHA (ComparED) Study[1–3]
Am J Clin Nutr 2016;104:280–7. Printed in USA. © 2016 American Society for Nutrition
CRP
IL-6
IL-18
TNF-α
Adiponectin
Total C
LDL-C
HDL-C
C/HDL-C
Apo B
TG
△EPA
△DHA
P = 0.01
P < 0.001
P < 0.001
P = 0.04
P < 0.0001
P = 0.006
P = 0.005
-25
-20
-15
-10
-5
0
5
10
15
Change vs. control, %

91